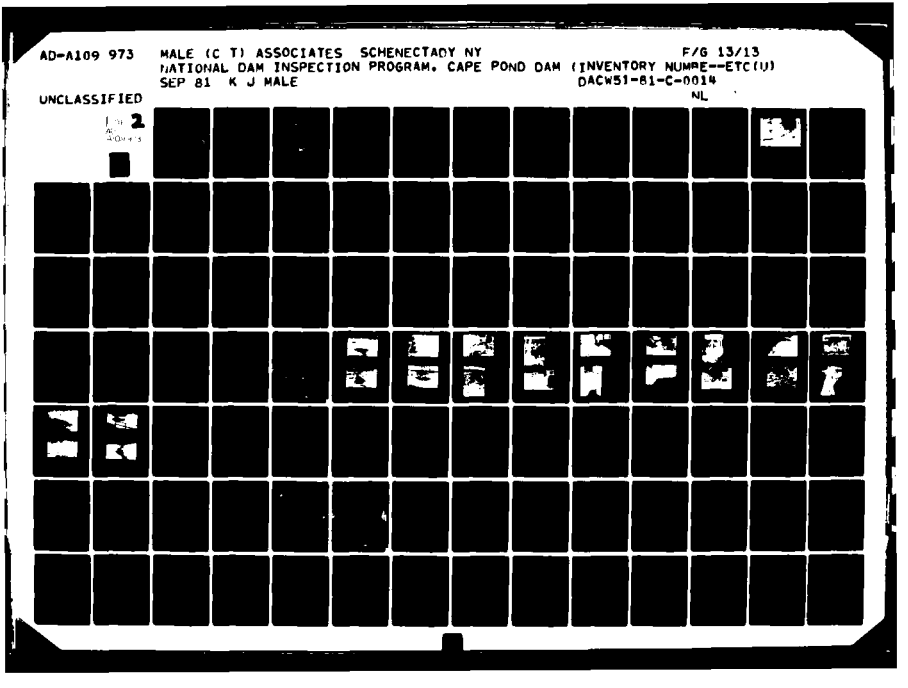
AD-A109 973 MALE (C T) ASSOCIATES SCHENECTADY NY F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. CAPE POND DAM (INVENTORY NUMBE--ETC(U)
SEP 81 K J MALE DACW51-81-C-0014

UNCLASSIFIED NL



AD A109973

DTIC FILE COPY

SECURITY CLASSIFICATION OF THIS PAGE (When Data Ente

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
Phase I Inspection Report
Cape Pond Dam
Lower Hudson River Basin, Ulster County, NY
Inventory No. 265

5. TYPE OF REPORT & PERIOD COVERED
Phase I Inspection Report
National Dam Safety Program

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
KENNETH J. MALE

8. CONTRACT OR GRANT NUMBER(s)
DACW51-81-C-0014

9. PERFORMING ORGANIZATION NAME AND ADDRESS
C.T. Male
3000 Troy Road
Schenectady, New York 12309

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
Department of the Army
26 Federal Plaza New York District, CofE
New York, New York 10287

12. REPORT DATE
14 September 1981

13. NUMBER OF PAGES

14. MONITORING AGENCY NAME & ADDRESS(If different from Controlling Office)
Department of the Army
26 Federal Plaza New York District, CofE
New York, NY 10287

15. SECURITY CLASS. (of this report)
UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; Distribution unlimited.

DTIC ELECTE JAN 25 1982 S H

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, If different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Cape Pond Dam
Lower Hudson River Basin
Ulster County

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the reporting organization.

Examination of available documents and visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some serious deficiencies which require further investigation and remedial work.

DD FORM 1473 EDITION OF 1 NOV 65 IS OBSOLETE

412600

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Hydrologic and hydraulic analysis indicates that maximum spillway discharge capacity is only about 21% of the PMF peak outflow. The 1/2 PMF would overtop the concrete and stone masonry dam. Structural stability analysis, indicates that overtopping due to 1/2 PMF would probably cause failure of the dam. It is judged that failure due to overtopping would significantly increase the hazard to loss of life downstream from that which would exist just prior to failure. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, spillway capacity is considered "seriously inadequate" and the dam is assessed as "unsafe, non-emergency".

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to loss of life downstream of the dam.

LOWER HUDSON RIVER BASIN

TOWN OF WAWARSING

ULSTER COUNTY, NEW YORK

CAPE POND DAM

NY - 00265

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY

NEW YORK DISTRICT, CORPS OF ENGINEERS

26 FEDERAL PLAZA

NEW YORK, NY 10278

JULY 1981

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

CAPE POND DAM, NY 00265

PHASE I INSPECTION REPORT

TABLE OF CONTENTS

	Page
PREFACE	i
TABLE OF CONTENTS	ii
ASSESSMENT	v
OVERVIEW PHOTO	viii
VICINITY MAP	ix
Section	
1 - PROJECT INFORMATION	
1.1 GENERAL	
a. Authority	1-1
b. Purpose of Inspection	1-1
1.2 DESCRIPTION OF PROJECT	
a. Location	1-1
b. Description of Dam and Appurtenances	1-2
c. Size Classification	1-2
d. Hazard Classification	1-3
e. Ownership	1-3
f. Operator	1-3
g. Purpose of Dam	1-3
h. Design and Construction History	1-3
i. Normal Operating Procedures	1-4
1.3 PERTINENT DATA	1-4
2 - ENGINEERING DATA	
2.1 DESIGN DATA	
a. Geology	2-1
b. Subsurface Investigations	2-1
c. Dam and Appurtenances	2-1
2.2 CONSTRUCTION HISTORY	2-1
2.3 OPERATION RECORD	2-3
2.4 EVALUATION	
a. Availability	2-4
b. Adequacy	2-4
c. Validity	2-4

		Page
3 -	VISUAL INSPECTION	
3.1	FINDINGS	
	a. General	3-1
	b. Dam	3-1
	c. Appurtenant Structures	3-2
	d. Reservoir Area	3-4
	e. Downstream Channel	3-4
3.2	EVALUATION	3-4
4 -	OPERATION AND MAINTENANCE PROCEDURES	
4.1	OPERATION PROCEDURES	4-1
4.2	MAINTENANCE OF DAM AND OPERATING FACILITIES	4-1
4.3	EMERGENCY ACTION PLAN AND WARNING SYSTEM	4-2
4.4	EVALUATION	4-2
5 -	HYDROLOGY AND HYDRAULICS	
5.1	DRAINAGE AREA CHARACTERISTICS	5-1
5.2	ANALYSIS CRITERIA	5-1
5.3	RESERVOIR CAPACITY	5-2
5.4	SPILLWAY CAPACITY	5-3
5.5	FLOODS OF RECORD	5-3
5.6	OVERTOPPING POTENTIAL	5-4
5.7	EVALUATION	5-4
6 -	STRUCTURAL STABILITY	
6.1	EVALUATION OF STRUCTURAL STABILITY	
	a. Visual Observations	6-1
	b. Design and Construction Data	6-1
	c. Operating Records	6-1
	d. Post-Construction Changes	6-1
	e. Seismic Stability	6-1
6.2	STABILITY ANALYSIS	6-2

7 - ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT
a. Safety 7-1
b. Adequacy of Information 7-1
c. Need for Additional Investigations 7-2
d. Urgency 7-2

7.2 RECOMMENDED MEASURES 7-3

APPENDICES

APPENDIX A - PHOTOGRAPHS

APPENDIX B - VISUAL INSPECTION CHECKLIST

APPENDIX C - HYDROLOGIC AND HYDRAULIC ENGINEERING DATA CHECKLIST AND COMPUTATIONS

APPENDIX D - STABILITY ANALYSIS

APPENDIX E - REFERENCES

APPENDIX F - AVAILABLE ENGINEERING DATA AND RECORDS

APPENDIX G - DRAWINGS

TABLES

Table 5.1 Overtopping Analysis 5-5

Table 6.1 Stability Analysis 6-3

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.: NY 00265

Name of Dam: Cape Pond Dam

State Located: New York

Municipality: Town of Wawarsing

Watershed: Lower Hudson River Basin

Stream: Beer Kill

Date of Inspection: April 8, 1981

ASSESSMENT

Examination of available documents and visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some serious deficiencies which require further investigation and remedial work.

Hydrologic and hydraulic analysis indicates that maximum spillway discharge capacity is only about 21% of the PMF peak outflow. The 1/2 PMF would overtop the concrete and stone masonry dam. Structural stability analysis, indicates that overtopping due to 1/2 PMF would probably cause failure of the dam. It is judged that failure due to overtopping would significantly increase the hazard to loss of life downstream from that which would exist just prior to failure. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, spillway capacity is considered "seriously inadequate" and the dam is assessed as "unsafe, non-emergency".

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to loss of life downstream of the dam.

Therefore, it is recommended that within 3 months after receipt of this report by the Owner, a detailed hydrologic and hydraulic analysis be started to better assess spillway capacity.

This should include a more accurate determination of the site specific characteristics of the watershed. Within 18 months after receipt of this report by the Owner, any appropriate remedial work should be completed. The detailed analysis and the design and construction observation of any remedial work should be done by a qualified, registered professional engineer.

In the meantime, the Owner should immediately institute a program to visually inspect the dam and its appurtenances at least once a month. Also, within 3 months after receipt of this report the Owner should complete development of a surveillance program for use during periods of heavy runoff and of an emergency action plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system.

Structural stability analysis indicates that for 1/2 PMF and PMF conditions the spillway has unsatisfactory stability and the dam section is unstable. For normal spring-summer-fall conditions both the spillway and dam appear to have satisfactory stability. Therefore, it is recommended that a detailed structural stability analysis of the dam and spillway, under flood loading conditions be started within 3 months after receipt of this report by the Owner. This analysis should include appropriate field and laboratory work to determine actual foundation material properties and structural details, including accurate cross sections of the dam and spillway. Any necessary remedial work should be completed within 18 months after receipt of this report by the Owner. The investigation and the design and construction observation of any remedial work should be done by a qualified, registered professional engineer.

Because of other deficiencies, the following additional investigation should be started within 3 months after receipt of this report by the Owner. The investigation should be performed by a qualified, registered professional engineer.

1) Observe the flow through and over the spillway at the right training wall of the spillway during periods of high water (6 inches or more of flow over the spillway) to determine whether alterations or repairs may be required in this vicinity.

Any remedial work deemed necessary as a result of the investigation should be completed within 18 months after receipt of this report by the Owner. A qualified, registered professional engineer should design and observe the construction of any necessary remedial work.

7.) The following remedial work should be completed by the Owner within 12 months after his receipt of this report. Where engineering assistance is indicated, the Owner should engage a qualified, registered professional engineer. Assistance by such an engineer may also be useful for some of the other work.

1) Seal the upstream side of the gravity section to reduce the quantity of and the pressure head due to seepage through it. Provide drainage facilities for such seepage that does occur.

2) Contingent on the results of the detailed hydrologic and hydraulic analysis and the detailed structural stability analysis, repair the deteriorated concrete and stone masonry of the gravity dam section, the spillway, and the spillway training walls.

3) Remove trees and brush and their root systems from the embankment, from a zone 15 feet wide next to the downstream toe, and from the area between the spillway and the natural stream channel in accordance with specifications and field observation of the work by an engineer. Backfilling the zones where stumps and roots have been removed should be done with proper material and procedures. Continue to keep these same areas clear by cutting, mowing, and cleanup at least annually.

4) Repair the riprap apron downstream of the spillway.

5) Repair the deteriorated joint in outlet pipe # 1 to prevent water from leaking out of the pipe into the area of the downstream rockfill.

6) Develop and implement effective routine operation and maintenance procedures for the dam and its appurtenances. The outlet pipe gates should be exercised regularly.

7) Institute a program of comprehensive technical inspection of the dam and its appurtenances by an engineer on a periodic basis of at least once every two years.

& LAND SURVEYOR

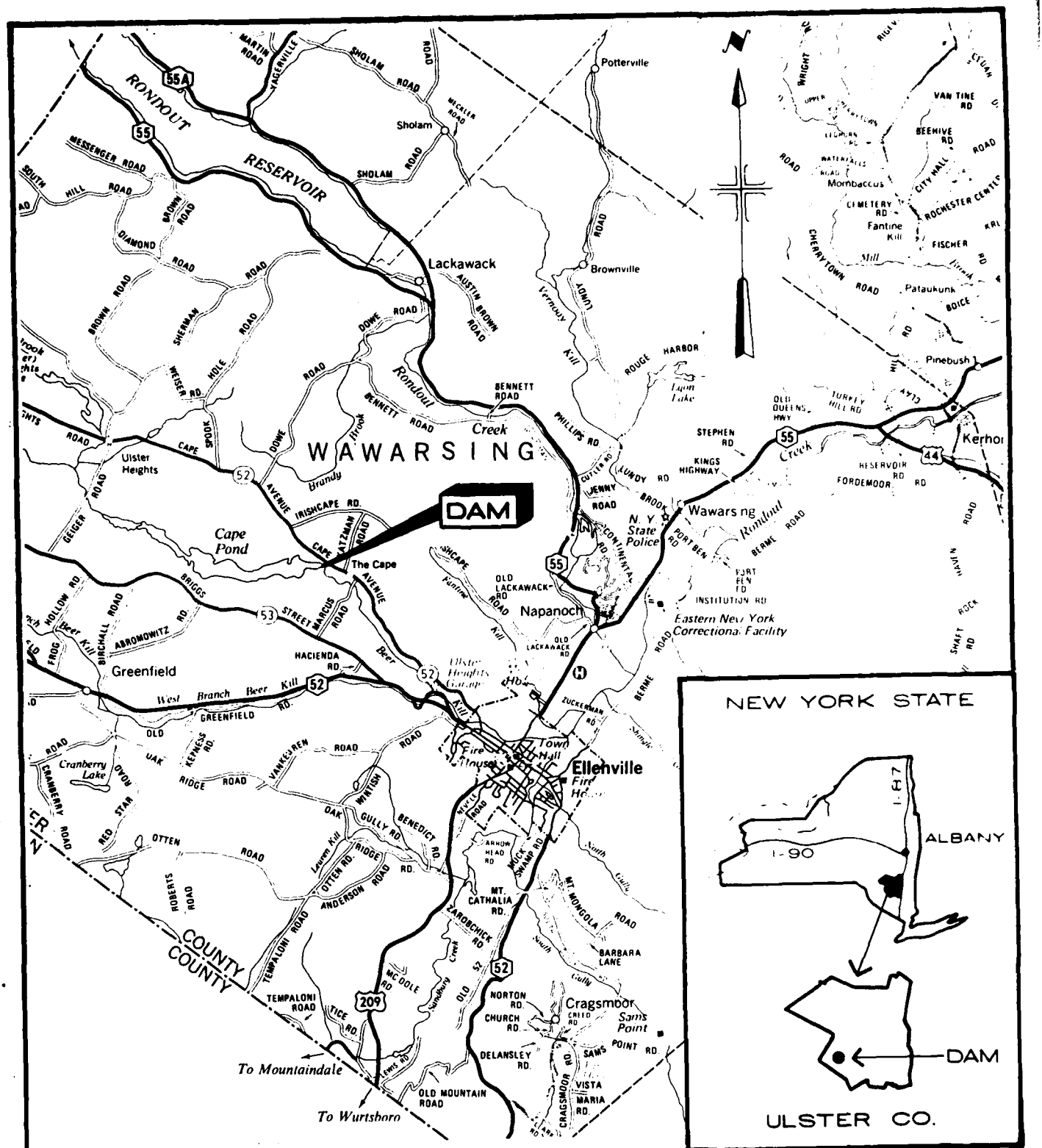
Kenneth J. Male
President
C. T. Male Associates, P.C.
NY PE 25004

Approved by:

Col. W. M. Smith, Jr.
New York District Engineer
Corps of Engineers

Date: 14 Sep 81

Overview Photo - Cape Pond Dam - 4/8/81



SCALE OF MILES

0 1 2 3

BASE MAP: ULSTER CO.
HIGHWAY MAP - 1977

CAPE POND DAM
VICINITY MAP

TOWN OF WAWARSING	ULSTER CO., NY
SCALE: 1" = 1.5 MILES	DATE: JANUARY 1981

C.T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309

PROJECT NO. 58.01.008/80.848

1x

1/ 4

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

NAME OF DAM: CAPE POND DAM, ID NO. NY 00265

SECTION 1

PROJECT INFORMATION

1.1 GENERAL

a. Authority

The National Dam Inspection Act, Public Law 92-367, August 8, 1972, authorized the Secretary of the Army through the Corps of Engineers to initiate a national program of dam inspection throughout the United States. The New York District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within New York State. C. T. Male Associates, P.C., has been retained by the New York District to inspect and report on selected dams in the State of New York. Authorization and notice to proceed was issued to C. T. Male Associates, P.C., under a letter from Michael A. Jezior, LTC, Corps of Engineers. Contract No. DACW51-81-C-0014 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

The purpose of the inspection program is to perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public, and thus permit correction in a timely manner by non-Federal interests.

1.2 DESCRIPTION OF PROJECT

a. Location

The dam is located on the Beer Kill about 2.5 miles northwest of the Village of Ellenville. The dam at its maximum section is at Latitude 41 degrees - 44.9 minutes North, Longitude 74 degrees - 26.3 minutes West.

Access to the dam is from the Village of Ellenville via Cape Avenue (County Route 52). The dam and reservoir are on the south side of the road (see Vicinity Map, and Drainage Area Map Appendix C-5).

2/ 5 The official name of the dam is Cape Pond Dam and the official name of the impoundment is Cape Pond. The impoundment is also known as Ulster Lake.

b. Description of Dam and Appurtenances

Cape Pond Dam is a grouted masonry gravity dam with a maximum height of about 20 feet and a crest length of about 612 feet. The spillway is near the center (highest) portion of the dam and the spillway crest is 5.25 feet below the top of dam. The dam consists of a 4-foot-thick grouted masonry gravity section which is founded on a 5-foot-thick concrete footing. A concrete ogee-like section was added in 1914 on the downstream side of the spillway.

To the left and to the right of the spillway section, rockfill or earth berms have been placed on the downstream side of the masonry. On the upstream side of the gravity section, a rockfill roadway has been placed to provide access across the dam. This rockfill is about 10 feet wide on the crest and its upstream slope is about 3H:1V. The crest of the rockfill slopes down from both abutments at about a 2% grade to its low point at spillway crest elevation.

The ogee-like spillway is a concrete gravity overflow section about 4 feet wide at the top with a crest length of 147 feet. The effective length of spillway weir is reduced by 11 piers, each one foot wide, located on the spillway weir crest, which serve as supports for a walkway that crosses over the spillway. There is a short stone masonry training wall on the left side of the spillway and a concrete training wall on the right. The discharge channel consists of a hand-placed stone riprap apron for about 30 feet downstream of the toe of the spillway section.

There are 2 slide gates on the upstream side of the gravity section which discharge their flow into 2, 48-inch-diameter riveted steel outlet pipes. Each slide gate has a handwheel control in a gate house. These gate houses are wood-framed structures that are situated on top of the concrete gravity portion of the dam, to the left of the spillway. The intakes to each slide gate are formed by concrete and masonry side walls through the upstream rockfill, with wooden bridge decks across the top. At the upstream ends of the intakes there are crude wooden trash racks with about one foot clear openings.

There is also a steel pipe walkway with a wooden deck across the top of the spillway.

c. Size Classification

In accordance with Recommended Guidelines (Reference 1), Cape Pond Dam is classified as "intermediate" in size because the maximum storage capacity at the top of the dam is 3,605 acre-feet (within the 1,000 to 50,000-acre-foot range). The height of the dam is about 20 feet.

d. Hazard Classification

In accordance with Recommended Guidelines (Reference 1), Cape Pond Dam is classified as having a "high" hazard potential. This is because it is judged that failure of the dam would significantly increase flows downstream which could cause loss of more than a few human lives and appreciable property damage. Downstream development that could be damaged or destroyed by a dam failure includes: a bridge for Marcus Road which crosses over the Beer Kill about 2,200 feet downstream; and many dwellings located near the stream outside of the Village of Ellenville, located about 2 miles downstream (vertical drop from the dam to these dwellings is over 500 feet).

e. Ownership

The dam was originally constructed sometime prior to 1904 for Dwight Divine and Sons. Presently the dam and reservoir are owned by:

Cape Pond, Inc.
Cape Road
Ellenville, New York 12428

Attention: William H. Lyons, President
Lyons Road
Milton, New York 12547
(914) 795-5164

f. Operator

Day-to-day operation of the dam is the responsibility of:

Andrew T. Jacob
Box 21A
Cape Pond Road
Ellenville, New York 12428

(914) 647-3207

g. Purpose of Dam

The dam was originally constructed to store water for hydropower generation, but it was never used for this purpose. The impoundment is presently used for recreational purposes.

h. Design and Construction History

It is believed that the dam was constructed sometime prior to 1904 for Dwight Divine and Sons (Ulster Knife Co.). The original designer is not known. A Mr. VanKeuren of Ellenville, New York, was the construction contractor for the original dam.

There are some details of the original design on a 1914 drawing concerning the addition of a concrete spillway section (see Appendix G-1). No other data concerning the original design or construction could be found.

According to a dam report dated August 13, 1914 (see Appendix F3-1), the dam was repaired or reconstructed in 1904. The nature or extent of this work is not known.

In September of 1914 the planking of a plank and stone-filled crib apron at the toe of the spillway was removed. The stone was grouted in place and a concrete ogee-like section was added to the downstream side of the spillway.

In 1970 slide gate # 1 was repaired. Part of the outlet pipe from this gate was replaced and the remainder was encased in concrete. The downstream rockfill was also rearranged and dressed up.

Refer to Section 2 of this report, as well as the Engineering Data Checklist in Appendix F2, for a more complete discussion of the design and construction history. A drawing and other engineering data are included in Appendices F3 and G.

i. Normal Operation Procedures

The Operator checks the dam daily. The Owner of the dam also has a dam committee, one of whose members also visits the dam once a week.

The maximum pond level was established by a court decision in the early 1900's. The Operator tries to maintain this level (slightly below the spillway crest) from April through October. Primarily gate # 1 (nearest the left end of the dam), which is the easiest to operate, is used to regulate outflow. During periods of high water both gates are used.

During the period of November through May the water level is maintained about 2 feet below the spillway crest, primarily to help control vegetative growth around the shoreline.

182 The Operator opens the gates in anticipation of heavy flows due to storms. From experience, 2 to 3 inches of rain causes about a 6 inch rise in the water level. According to the Operator, with both gates open it takes about 36 hours to drop the water level to the old channel, essentially draining the reservoir.

1.3 PERTINENT DATA

a. Drainage Area (square miles) 19.25

b. Discharge at Dam Site (cfs)

Spillway (W.S. at top of dam)	4,890
Outlet Pipe # 1 (normally partially open)	
- (fully open w/W.S. at top of dam)	240
- (fully open w/W.S. at spillway crest)	200
Outlet Pipe # 2 (normally closed)	
- (fully open w/W.S. at top of dam)	210
- (fully open w/W.S. at spillway crest)	160
Spillway and Both Outlet Pipes Fully Open (W.S. at top of dam)	5,340
Maximum Known Flood	> 4,900

c. Elevations (feet - NGVD)

Based on USGS mapping the elevation base used on the drawing by J.H. Divine in Appendix G appears to be about 900 feet lower than NGVD (National Geodetic Vertical Datum of 1929). Therefore, all elevations used in this report are 900 feet higher than those found on the drawing in Appendix G and are in feet above mean sea level NGVD.

Top of Dam	1005.25
Design High Water	Unknown
Spillway Crest	1000
Entrance Invert of Outlet Pipe # 1	986.8 ±
Entrance Invert of Outlet Pipe # 2	991.4 ±

d. Reservoir Length (feet) - at spillway crest 6,300 ±

e. Reservoir Surface Area (acres)

Top of Dam	448
Spillway Crest	229.6

f. Reservoir Storage (acre-feet)

Top of Dam	3,605
Spillway Crest	1,377

g. Dam

Type - Grouted masonry and concrete gravity with partial earth berms.
Length - 612 feet (including spillway).
Top Width - Gravity Section - 4 feet.
Upstream Rockfill - 10 feet.
Side Slopes - Upstream: 3H:1V.
- Downstream right of spillway: Flat to 3H:1V.
- Downstream left of spillway: 6-feet wide rockfill berm with vertical face.
- Downstream between gate houses: 4H:1V for 15 feet, then 1H:1V.

Zoning - Berms on both sides of grouted masonry section.
Impervious Core - Grouted masonry gravity section forms the impervious core.
Cutoff - 5-foot-thick concrete footing (apparently on till) forms cutoff.

Grout Curtain - None known.

h. Spillway

Type - Ogee-like with wooden walkway across top, at top of dam elevation.

Length of Weir - 136 feet clear (147 feet if 11, 1 foot wide piers, are included).

Upstream Channel - Rockfill roadway 10 feet wide at spillway crest elevation, immediately upstream. Pond surface upstream of roadway.

Downstream Channel - 30-foot-wide hand-placed riprap apron downstream of ogee with stone masonry training wall on left and concrete one on right. Further downstream natural ground, with tree and brush growth, until the natural stream channel.

i. Outlet Works

1) Outlet Pipe # 1

Size - 48-inch diameter.

Description - 35-foot long riveted steel pipe downstream from slide gate at gravity section.

Control - Slide gate with handwheel control at gate house on gravity section. Gate opens up about 40 inches maximum.

18

2) Outlet Pipe # 2

Size - 48-inch diameter.

Description - 20-foot long riveted steel pipe downstream from slide gate at gravity section.

Control - Slide gate with handwheel control at gate house on gravity section. Gate opens up about 2 feet maximum.

17

SECTION 2

ENGINEERING DATA

2.1 DESIGN DATA

a. Geology

There was no geologic information available in the data for this dam. The following information was obtained from current geologic maps and publications for this region (References 28, 29, and 30), as well as from the site visit.

Cape Pond Dam is located in the Catskill Section of the Appalachian Plateaus Province. The dam is located on the eastern fringes of generally flat-lying sedimentary sequences that underlie the Catskill Mountains and associated plateaus. Bedrock in the vicinity of the dam consists of shale and sandstone, which is middle to upper Devonian in age (350 - 375 million years old).

There is no surficial geology map available for this site.

b. Subsurface Investigations

No subsurface investigations are available for this dam.

Based on the appearance of the landscape surrounding the dam and a notation in a reconstruction application dated September 22, 1914 to the New York State Conservation Commission (see Appendix F3-6), the dam is probably founded on glacial till. The till may be clayey in nature, based on the 1914 Application.

c. Dam and Appurtenances

It is suspected that the dam was constructed prior to 1904 for Dwight Divine and Sons (Ulster Knife Co.). The original designer is unknown. No direct data concerning the original design of the dam could be found. There are some details of the original design on a September 1914 drawing concerning the addition of a concrete spillway section (see Appendix G-1). A September 1914 letter and reconstruction application also contain some additional data concerning the original design (see Appendices F3-4 to F3-12).

2.2 CONSTRUCTION HISTORY

a. Initial Construction

The original contractor for the dam was a Mr. VanKeuren of Ellenville, New York. No records concerning the actual con-

struction of the original dam and appurtenances are known to exist. A brief review of the construction history can be found in Appendix F2, Checklist for General Engineering Data and Interview with Dam Owner.

234 b. Modifications and Repairs

According to an inspection report dated August 13, 1914 (see Appendix F3-1), the dam was repaired or reconstructed in 1904. The nature or extent of this work is not known.

In September of 1914 the planking of a plank and stone-filled crib apron at the toe of the original spillway was removed (see Appendix G-1). The stone was grouted in place and a concrete ogee-like section was added to the downstream side of the spillway. J. H. Divine, Engineer, of Ellenville, New York was the designer of these modifications. The construction contractor for this work is not known.

In 1970 slide gate # 1 was repaired. Part of the outlet pipe from this gate was also replaced and the remainder was encased in concrete. The rockfills on the downstream side of the dam were also rearranged and dressed up. There are no plans or records for this work, except for bills. The contractor for this work was McDole Construction Company, Wawarsing, New York.

In 1978 the concrete sill below slide gate # 2 was replaced. This work was done by members of Cape Pond, Inc.

Also in the past other repair work has been done to the dam at various times. It is evident that concrete patching of the gravity and spillway sections has been done in the past. Also at some time in the past the flashboards were removed and some of the flashboard support sockets were filled with cement grout.

c. Maintenance and Pending Remedial Work

According to the Owner, each year about 30 or 40 tons of "clay" is dumped on the upstream side of the dam. It is dumped on the roadway and dozed into the reservoir. This work is done by a variety of local contractors.

After November first the water level is quickly dropped to the level of the slide gate sills so that the slide gates, sills, and any other items exposed can be inspected. The water level is then allowed to rise again.

In 1975 the Owner of the dam obtained cost estimates for guniting the downstream face of the spillway and exposed gravity section. This work was never done because of the cost.

2.3 OPERATION RECORD

a. Inspections

There is no known record of inspection of the dam by the Owner.

Several inspection reports and letters concerning this dam were found and they appear in Appendix F3. An August 3, 1914 Dam Report by the NYS Conservation Commission (see Appendix F3-1) describes the dam as "of very good construction and in very good condition." This report was prepared before the ogee-like section was added to the spillway.

An August 22, 1972 inspection report by the New York State Department of Environmental Conservation (NYS-DEC) appears as Appendix F3-15. This report noted that the exposed concrete surfaces were spalled, cracked, and deteriorated. It noted the presence of brush growth on the downstream slope of the dam and that there was a new concrete headwall at the end of the outlet conduit downstream of gate # 1. The report also indicated that there was no evidence of periodic maintenance.

A NYS-DEC memorandum dated August 23, 1972 (see Appendix F3-18) generally discusses the August 22, 1972 NYS-DEC inspection report. It mentions the problems noted in that inspection report as well as several others. This memorandum indicates that trees as well as brush are growing on the downstream slope, that there was leakage through the ogee-like section at its mid-point, and that stone rubble and brush were observed clogging the stilling basin downstream of outlet pipe # 1. This memorandum also noted that "the dam has received little maintenance for a long period of time" and suggested that a regular maintenance schedule, that addressed the problems of the dam, be implemented.

A December 20, 1977 letter from the Owner to the NYS-DEC (see Appendix F3-20) requested that the NYS-DEC inspect Cape Pond Dam. No record of any subsequent inspection, however, could be found.

Various members of Cape Pond, Inc. indicated that the dam has been inspected informally by engineers who are friends of members.

b. Performance Observations, Water Levels, and Discharges

The present seepage at the dam is about the same now as it was 20 years ago according to the members of Cape Pond, Inc., interviewed at the dam site.

Since May, 1979 the Operator of the dam has kept a daily log, mainly for security purposes. In the log, however, he has

noted when the water level is over the road or spillway. No other performance observations or routine measurements of water levels or discharges are known to exist.

c. Past Floods or Previous Failures

In August or September of 1955 the dam was overtopped by an unknown amount without causing any damage. In the early 1970's Ulster Heights Lake Dam, an upstream earth dam, failed and again caused Cape Pond Dam to be overtopped by an unknown amount. No damage resulted from this occurrence either. In 1977 or 1978 Ulster Heights Lake Dam failed again, but this time Cape Pond Dam was not overtopped. Also, according to the Operator, a storm event on March 6, 1980 caused the water level to rise about 2.8 feet above the spillway crest.

2.4 EVALUATION

a. Availability

As listed on Appendix F1, some engineering data and records for the dam were available in the files of the Dam Safety Section of the NYS-DEC. Some photos of the 1978 repair work and the daily log from May 1979 to the present were available from the Owner, but were not reviewed. The data from the NYS-DEC was reviewed, and all copies of the records found are included in chronological order in Appendices F3 and G. Appendix F2, Checklist for General Engineering Data and Interview with Dam Owner, also contains pertinent engineering information.

b. Adequacy

Available data reviewed consisted of one reconstruction drawing, a reconstruction application, 2 inspection reports, and various correspondence. Such data as original design drawings, construction specifications, design calculations, record drawings, complete data on foundation and embankment soils, and operation and performance data were not available. The lack of such in-depth engineering data does not permit a comprehensive review. Therefore, the available data was not adequate by itself to permit an assessment of the dam.

551 c. Validity

Based on field observation and checking, some of the data is not valid. The drawing appearing as Appendix G-1 shows the dam as 697.5 feet long, while field measurements indicate a length of about 612 feet. This discrepancy, however, could be due to some of the gravity section being buried underground.

The drawing of Appendix G-1 does not show the gate houses on the top of dam which presently exist. Finally the same drawing shows 14 piers in the spillway. Field observations indicate that there are only 11, with wider pier openings at the location of the missing piers.

55

SECTION 3

VISUAL INSPECTION

3.1 FINDINGS

a. General

Cape Pond Dam was inspected on April 8, 1981. The inspection party (see Appendix B-1) was accompanied by various individuals associated with the organization that owns the dam, Cape Pond, Inc. These individuals were William H. Lyons, President; Andrew T. Jacobs, Dam Operator; Sherman B. Loucks, member; and Thomas H. Clark, member. The weather was sunny and warm at the time of the inspection. The water surface was at about EL 1000 or at about the spillway crest. The Visual Inspection Checklist is included as Appendix B, while selected photos taken during the inspection are included as Appendix A and as the Overview Photo at the beginning of this report. Appendix A-1 is a photo index map.

b. Dam

There were no major sloughs or slides evident on the embankment portions of the dam.

Trees and Brush - Trees and brush cover the downstream slope to the right of the spillway. Some of these trees are as large as 20 inches in size. Brush to 10 feet high grows between the trees (see Photo A-3A). Leaves and other debris have been discarded along portions of the downstream slope. All of this cover interferes with proper inspection.

To the left of the spillway, there are a few trees growing from the rockfill berms on the downstream side of the concrete gravity section (see Photo A-4A).

Seepage - Seepage is occurring at low rates (<< 1 gpm) at several locations from the downstream side of the spillway. These seeps seem to be associated chiefly with construction joints, since they tend to lie along horizontal lines. Photo A-10A shows a detail of the downstream side between Sta 4+60 and Sta 4+85, where it is seen that seepage is occurring only a few inches below the crest (top right in the photograph). Since the reservoir level was only a few inches below the spillway crest on the day of inspection, this observation shows that full reservoir head is acting on the upstream side of the concrete gravity section. There is no loss in hydraulic head through the fill that forms the roadway on the upstream side.

Minor clear seeps also were observed on the downstream side of both gate houses. Photo A-4B shows the seep beneath the left gate house (gate house # 1). Both were seeping at a rate of a few drops per second or less.

Another minor seep was observed on the downstream side of the concrete gravity section at Sta 3+30. It is located just above ground surface in Photo A-5A (which is 8 feet below the top of the crest wall). The seepage rate was one drop per 10 seconds.

A rockfill berm was observed on the right side of the right training wall of the spillway (see Photo A-5B). This berm may have been placed to prevent scour during spillway flow. However, at the toe of this fill adjacent to the training wall a large opening was observed in the rockfill. There was no seepage occurring. Flow may occur at this location when flow passes over the spillway, by passing through the cracks in the top portion of the training wall.

Concrete and Masonry - The concrete and masonry gravity sections of the dam are in poor condition. There are vertical cracks through the wall in several locations. The top 4 feet of the gravity section is badly deteriorated on both the upstream and downstream sides, with portions of the wall missing to a depth of one foot (see Photos A-3B and A-5A). The concrete cap on the wall is also deteriorated, scaled, and it has been repaired in several locations.

c. Appurtenant Structures

1) Intake Structures and Gate Houses

The intake structures to the two slide gates (see Photo A-2A) are formed by concrete and masonry side walls through the upstream rockfill to the gravity section, with wooden bridge decks across the top. The intakes are submerged and therefore the condition of their side walls could not be assessed. At the upstream ends of the intake there are crude wooden trash racks made of 1 inch to 2 inch sticks, with one foot clear openings. Though crude, these intakes are in fairly good condition (see Photo A-7B) and are adequate to perform their functions.

There are two gate houses (see Appendix A-4A) located on top of the concrete gravity section that protect the handwheel control mechanisms for the slide gates. The gate houses are wood-framed structures with electric lights and locking doors. Both gate houses are in good condition although the roof of gate house # 2 leaks.

75 The slide gates for both dams were only visible from the downstream side. Both gates were rusty but in good shape, with some leakage around them when closed (see Photo A-9A). The hand-wheel controls for raising the gates (see Photos A-6B and A-8A) were well lubricated. Gate # 1 operates easily and is operated regularly. Gate # 2 operates somewhat harder and is only operated when required to control high flows.

2) Outlet Pipes and Outlet Structures

The ends of the 2, 48-inch riveted steel outlet pipes can be seen in Photos A-7A and A-8B. Outlet pipe # 1 is rusted and pitted. A joint in this pipe about 10 feet from the downstream end is open about one foot (see Photo A-9A). The last 10 feet of this pipe is also encased in concrete.

Outlet pipe # 2 is also rusted and pitted. The downstream end of the pipe is rusted through to the bottom but this does not interfere with the function of the outlet. There is no headwall at the downstream end of this pipe.

3) Spillway and Discharge Channel

The dam has an ogee-like overflow spillway with 11 piers along its crest that support a walkway across the top of the spillway (see Photo A-9B). To the left of the spillway section there is a stone masonry training wall and to the right there is a concrete one. At the toe of the ogee there is a hand-placed riprap apron in the discharge channel.

The downstream concrete of the ogee-like spillway section is spalled and cracked (see Photos A-9B and A-10A). The surface was gunited in the past but it is now flaking and falling off. There is seepage through the section, probably at the location of construction joints. The toe of the ogee-like section is breaking up and there is also some erosion of the concrete. The piers on the weir crest have cracks, spalls, popouts of 1 inch to 3 inches in diameter, and efflorescence (see Photo A-10B). The weir crest also has several transverse cracks from the upstream to the downstream side. The first spillway bay on the left is also badly spalled and three piers for the walkway over the spillway appear to be missing.

There is a large crack near the top of the right spillway training wall at the change in slope (see Photos A-5B and A-6A). There is also cracking and efflorescence of the concrete of this wall.

555 The hand-placed riprap apron downstream from the weir crest is in fair shape (see Photos A-11A and A-11B). Some of the riprap at the downstream end is deteriorated, while elsewhere some of it was missing or disturbed. There is also some brush and tree growth at the downstream end of the apron.

d. Reservoir Area

The reservoir shores are relatively flat and forested. There was no obvious cause for concern about landslides into the reservoir or unusual erosion of the slopes (see Photo A-12A).

e. Downstream Channel

The downstream channel (see Photo A-11B) is a brush and tree-covered area of natural ground from the apron to the Beer Kill channel. This area is about 4 feet lower than the riprap apron and is relatively flat down to the natural stream channel. The natural channel is much narrower than the spillway and is encroached by heavy brush and tree growth.

3.2 EVALUATION

The trees, brush, and debris on the downstream side of the dam, both to the left and to the right of the spillway, probably do not have any significant effect on the structural stability of this dam. They do, however, prevent adequate observation of any potential seepage. The brush, trees, and debris should be removed from the dam to a distance of 15 feet downstream from the toe. Additionally, all trees and brush between the spillway and the natural stream channel should be cleared to a width at least equal to that of the spillway.

The deteriorated concrete of the gravity dam section and the spillway should be repaired in an appropriate manner. The spillway training walls should also be repaired.

556 The seepage observed was minor, although freezing and thawing at the seeps will continue to cause deterioration. On the downstream side of the spillway the seeps have existed for a long time. In the past they were sealed with a coating of gunite. This procedure leads to pressure buildup along the construction joints of the concrete spillway, with consequent reduction in stability. Ultimately this gunite covering spalls off and the seepage continues. When the spillway concrete is repaired, drainage from these seeps should be permitted to continue. The seeps should not be plugged.

The rockfill on the right side of the right spillway training wall should be observed during high flows over the spillway so that a judgment can be made about any needed repairs.

The rockfill apron downstream of the spillway should be repaired to prevent further deterioration.

55

SECTION 4

OPERATION AND MAINTENANCE PROCEDURES

4.1 OPERATION PROCEDURES

There are no written operation procedures for the dam.

Cape Pond is used for recreational purposes. The water level is maintained at about the spillway crest from April through October, and about 2 feet below the spillway crest from November through March, primarily to help control vegetative growth around the shoreline. The two outlet gates are operated as required to maintain the water level, with gate # 1 being used first.

The maximum pond level was established by a court decision in the early 1900's (see Appendix F2-4). This level is a paint mark on a retaining wall to the left, upstream side of the dam, which is slightly lower than the spillway crest. This water level precludes the use of flashboards on the dam and they have not been used since the early 1900's. The Operator uses his discretion to maintain this level by operating the outlet gates. Primarily gate # 1, which is the easiest to operate, is used to regulate outflow. During periods of high water both gates are used. In the past two years gate # 2 was used only twice, on March 6, 1980 and February 20, 1981.

The Operator opens the gates in anticipation of heavy flows due to storms. From experience, 2 to 3 inches of rain causes about a 6 inch rise in the water level. According to the Operator, with both gates open it takes about 36 hours to drop the water level to the old channel, essentially draining the reservoir.

At the time of the inpsection the pond level was about one inch below the spillway crest with outflow from the gates estimated to be 25 cfs.

4.2 MAINTENANCE OF DAM AND OPERATING FACILITIES

There are no written maintenance procedures for the dam.

The part-time operator for the dam lives in a house adjacent to the dam and checks the dam daily. Since 1975 the Owner of the dam has had a dam committee, one of whose members also visits the dam once a week.

55o Each year 30 to 40 tons of "clay" is dumped on the upstream side of the dam, as discussed in Section 2.2c. Also, each summer, various members of Cape Pond, Inc. do some minor concrete patching to the dam and appurtenances.

4.3 EMERGENCY ACTION PLAN AND WARNING SYSTEM

There is no emergency action plan and warning system for the dam.

4.4 EVALUATION

Maintenance of the dam and appurtenances is unsatisfactory. The condition of the dam and its appurtenances indicates that the dam does receive some routine maintenance and repair work on the gates and the concrete surfaces. Tree growth on the downstream side of the dam and in the spillway discharge channel, as well as some major concrete deterioration, however, have been allowed to occur. More effective and all-encompassing maintenance procedures need to be developed and implemented by the Owner in order to avoid the continued deterioration of the dam.

The Owner should develop an emergency action plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 DRAINAGE AREA CHARACTERISTICS

Cape Pond Dam and Cape Pond are located on the Beer Kill in southeastern New York. About 4 miles downstream of the dam the Beer Kill joins Sandburg Creek. Sandburg Creek drains to the northeast into Rondout Creek. Rondout Creek flows east and discharges into the Hudson River.

The total drainage area at the dam is 19.25 square miles, of which about 0.36 square miles (229.6 acres), or almost two percent, is the surface area of Cape Pond at the spillway crest. Another 0.076 square miles (48.4 acres) of the total drainage area consists of the surface of an upstream reservoir in the drainage area, Ulster Heights Lake. The total drainage area upstream of and including Ulster Heights Lake is 8.99 square miles. Ulster Heights Lake Dam, NY 01107, is not covered by a Phase I Inspection Report. The drainage area of Cape Pond is located in the foothills of the Catskill Mountains and has slopes which range up to 20%. Elevations in the drainage area vary from EL 1000 to EL 1840. (See Appendices C-5 and C-6).

5.2 ANALYSIS CRITERIA

The U.S. Army Corps of Engineers Hydrologic Engineering Center's Program HEC-1 DB (Reference 3) was used to develop the test flood hydrology and perform the reservoir routing.

The purpose of this analysis was to evaluate the dam and spillway with respect to their surcharge storage and spillway capacity. Accordingly, it was assumed that the water surface was at the spillway crest at the start of the flood routing. In addition, both outlet gates were assumed to be fully open when the water surface was one foot over the spillway crest.

A constant base flow of 2 cfs per square mile was chosen to represent average conditions in the drainage area and was inputted into the program for all subareas.

The index PMP (probable maximum precipitation) inputted to the HEC-1 DB program was 21 inches for a 24-hour duration all-season storm over a 200-square-mile basin, according to HMR 33 (Reference 4). Maximum 6-hour, 12-hour, 24-hour, and 48-hour precipitation for the actual size of the drainage area (same for 10 square miles or less) were inputted to the program as percentages of the index PMP in accordance with HMR 33. A storm reduction coefficient was then applied internally by the program in order to transpose or center the storm over the actual total drainage area. Thus, the corrected 48-hour PMP for the actual total drainage area became 23.1 inches. All rainfall was distributed using the Standard Project Storm arrangement embedded in the program.

Appendices C-7 and C-8 summarize the subarea, loss rate, and unit hydrograph data inputted to the program. Four subareas were used to model the drainage area. Subarea 1 consists of all the drainage area around an upstream reservoir, Ulster Heights Lake, and Subarea 2 consists of just the surface of Ulster Heights Lake. Subarea 3 consists of all the drainage area around Cape Pond, excluding Subareas 1 and 2. Subarea 4 consists of the surface of Cape Pond.

For the land in Subareas 1 and 3, loss rates were assumed to be 1.0 inch initially and a constant 0.1 inch per hour thereafter. Snyder unit hydrograph parameters were chosen from the 1977 Lower Hudson River Basin Hydrologic Flood Routing Model (Reference 20). A conservative standard lag time was computed. The program uses the inputted lag time and Snyder peaking coefficient to solve by iteration for approximate Clark coefficients, which are then used to calculate the runoff hydrographs.

For the reservoir surfaces making up Subareas 2 and 4, loss rates were set to zero so that rainfall would equal rainfall excess, or runoff. Assuming no delay in the rainfall/runoff response, a constant unit hydrograph for a rainfall duration equal to the HEC-1 DB calculation interval was developed per Appendices C-7 and C-8 and inputted to the model for each reservoir.

Flows were routed through Subarea 2, Ulster Heights Lake, using the HEC-1 DB program in the same way as for Cape Pond. The development of elevation-storage and discharge data for Ulster Heights Lake is shown on Appendices C-9 and C-10. Routing was started with the water surface at the service spillway crest and the outlet works were assumed closed. Ulster Heights Lake Dam (see Photo A-12B) has a drop inlet service spillway and 2 overflow auxiliary spillways.

Flow from Ulster Heights Lake was routed through Subarea 3 to Cape Pond by the HEC-1 DB program using normal depth channel routing. The inputted typical cross sections defining the channel reaches were developed from and are located on the Drainage Area Map, Appendix C-5. Hand plottings of the cross sections are included as Appendix C-11.

The floods selected for analysis were the PMF (probable maximum flood) and 1/2 PMF. Floods as ratios of the PMF (e.g., 1/2 PMF) were taken as ratios of runoff, not of precipitation. Peak inflow to Cape Pond for the PMF is 26,900 cfs or 1,397 csm (cfs per square mile). Peak outflow is reduced by reservoir routing to 25,400 cfs (1,319 csm). For 1/2 PMF the peak inflow is 13,000 cfs (675 csm) and the routed peak outflow is 10,900 cfs (566 csm).

5.3 RESERVOIR CAPACITY

Storage capacity for the reservoir (assumed to be at the spillway crest, EL 1000) was obtained from an application for the

reconstruction of the dam dated September 22, 1914 (see Appendix F3-7). USGS contour mapping (see Appendix C-5) was used to obtain area measurements inside contour elevations above the spillway crest and the capacity of the reservoir for these areas was computed by the method of conic sections. A tabulation of the hand-computed reservoir volumes inputted to the program is on Appendix C-12.

At the spillway crest, EL 1000, the reservoir has a capacity of 1,377 acre-feet. At the top of dam, EL 1005.25, the reservoir has a capacity of 3,605 acre-feet. Surcharge storage between the spillway crest and the top of dam amounts to 2,228 acre-feet, or about 2.2 inches of runoff from the 19.25-square-mile drainage area. Therefore, the reservoir has some capacity to attenuate peak inflow.

5.4 SPILLWAY CAPACITY

The dam has a 136-foot-long (clear opening) concrete ogee-like spillway. The top of dam is about 5.25 feet higher than the spillway crest. In addition, the dam has 2 gated outlets which can be and are operated during high flow periods.

The discharge capacity for the spillway was computed assuming critical flow over a broad-crested weir with end contractions and pier losses. Since the spillway weir is not a true ogee, and because of the roadway upstream of and level with the crest, the broad-crested weir approximation is considered appropriate. The spillway discharge computations are presented on Appendix C-13. With water 5.25 feet over the spillway crest (i.e., water level at top of dam) the spillway discharges about 4,890 cfs.

The dam also has two gated outlet pipes which were considered fully open when the water surface was one foot over the spillway crest. These pipes were both modeled as orifices with free discharge. The outlet pipe discharge computations are presented on Appendix C-14. With the water level at the top of dam the outlet pipes have a total discharge capacity of about 450 cfs.

Total discharge computations are summarized on Appendix C-15. Total discharge from the dam is the sum of the discharges from the spillway and both gated outlet pipes fully open, plus flow over the dam for the overtopping condition. The top of the dam was modeled as an ideal broad-crested weir. With the water level at the top of dam, EL 1005.25, total discharge capacity is due to the spillway plus both outlet pipes fully open, or about 4,890 + 450 = 5,340 cfs.

5.5 FLOODS OF RECORD

There are no written records of past flood discharges at the dam. However, as noted in Section 2.3b, in August or September of 1955 the dam was overtopped.

In the early 1970's the dam was also overtopped when an upstream dam, Ulster Heights Lake Dam, failed. Therefore, the flood of record is estimated to have been at least 4,900 cfs, which is slightly greater than the capacity of the just spillway with the water surface at the top of dam.

5.6 OVERTOPPING POTENTIAL

The results of the overtopping analysis using the HEC-1 DB program are summarized in Table 5.1. The overtopping analysis computer input and output for the PMF and 1/2 PMF are included starting on Appendix C-16.

As noted from Table 5.1, the PMF overtops the dam by about 4.4 feet maximum with duration of overtopping of about 7.3 hours. The 1/2 PMF also overtops the dam but only by about 1.7 feet maximum with duration of overtopping of about 5.3 hours. Peak inflows are 26,900 cfs for the PMF and 13,000 cfs for 1/2 PMF. Peak outflows are reduced by reservoir routing to 25,400 cfs for the PMF and 10,900 cfs for 1/2 PMF. Time to maximum stage, or the time from the start of the 48-hour storm to peak outflow, is about 44.2 hours for the PMF and 45.3 hours for the 1/2 PMF. The peak portion of the inflow and outflow hydrographs for the PMF and 1/2 PMF are shown by the computer plots on Appendices C-26 and C-27. Total project discharge capacity at the top of dam is due to the spillway, as well as both outlet pipes fully open, and is about 5,340 cfs, or only about 21% of the PMF peak outflow and about 49% of the 1/2 PMF peak outflow.

5.7 EVALUATION

Maximum spillway discharge capacity (with both outlet pipes open) is only about 21% of the PMF peak outflow. The 1/2 PMF would overtop the concrete and stone masonry dam. Structural stability analysis indicates that overtopping due to 1/2 PMF would probably cause failure of the dam. It is judged that failure due to overtopping would significantly increase the hazard to loss of life downstream from that which would exist just prior to failure. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, spillway capacity is considered "seriously inadequate" and the dam is assessed as "unsafe, non-emergency".

TABLE 5.1

CAPE POND DAM

OVERTOPPING ANALYSIS

CONDITIONS

Total Drainage Area = 19.25 square miles including Ulster Heights Lake and its drainage area.
Start Routing at Spillway Crest EL 1000
Top of Dam EL 1005.25
Total Project Discharge Capacity at Top of Dam = 5,340 cfs ± due to spillway and outlet gates # 1 and #2 fully open.
Some values rounded from computed results.

	PMF	1/2 PMF (a)
INFLOW		
48-hour Rainfall (inches)	23.1	13.4 (b)
48-hour Rainfall Excess (inches) (c)	19.5	9.7 (d)
Peak Inflow (cfs)	26,900	13,000
Peak Inflow (csm)	1,397	675
OUTFLOW		
Peak Outflow (cfs)	25,400	10,900
Peak Outflow (csm)	1,319	566
Time to Peak Outflow (hours)	44.2	45.3
Maximum Storage (acre-feet)	5,435	4,300
Max. W.S. Elevation (feet-NGVD)	1009.7	1007.0
Minimum Freeboard (feet)	overtopped	overtopped
Maximum Depth over Dam (feet)	4.4	1.7
Duration of Overtopping (hours)	7.3	5.3

(a) One half of PMF total runoff, including base flow. For PMF base flow = 2 cfs per square mile = 39 cfs.
(b) Approximation assuming total losses are the same as for the PMF.
(c) Rainfall Excess = Rainfall for the Reservoir Surface. For the rest of the drainage area, losses are assumed to be 1.0 inch initially and 0.1 inch per hour thereafter.
(d) Equal to one-half of PMF value.

SECTION 6

STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

There are no visual observations that indicate structural instability of Cape Pond Dam.

b. Design and Construction Data

The available design data do not show any reason to suspect structural instability of this dam. However, prior to 1914, at which time the ogee-like spillway was added on the downstream side of the original concrete dam, the original dam may have been of borderline stability.

No existing stability analysis was found for any part of the dam or spillway.

c. Operating Records

No operating records were found or operational problems reported which would adversely affect the stability of the dam. As discussed previously in Section 2.3c, the dam has withstood overtopping on two occasions in the past.

d. Post-Construction Changes

It is not known when the roadway fill was placed on the upstream side of the gravity section. It may have been part of the original construction, or it may have been placed after the ogee-like spillway was added in 1914. In any case, this fill causes the gravity section to be less stable than it would be without the fill. The fill adds earth pressure in the downstream direction. The water pressure against the upstream side of the masonry is not affected by the presence of the fill because the fill is far more pervious than the leaky masonry wall. Thus, the full reservoir head acts against the masonry.

e. Seismic Stability

This dam is in Seismic Zone 1. According to Recommended Guidelines (Reference 1), a seismic stability analysis is not required.

6.2 STABILITY ANALYSIS

The concrete spillway and the upper portions of the dam can be considered gravity structures. An independent structural stability analysis was performed on a section of both the spillway and the dam. The cross section for analysis of the spillway was chosen through one of the walkway piers where the exposed height is greatest. The cross section geometry is based on the spillway modification drawing, Appendix G-1. The cross section for analysis of the dam was chosen to the right of the spillway at about Sta 3+40 where the exposed, unsupported downstream height is greatest. The cross section geometry is based on rough field measurements and visual observation (see Photo A-5B). The following loading cases were analyzed for both the spillway and the dam:

Case 1 - Normal pool at spillway crest, no tailwater by observation, full headwater uplift, roadway fill load on upstream side, apron resistance on downstream side of spillway.

Case 2 - Normal pool plus ice load was not analyzed because ice acts against the upstream side of the roadway fill. This force cannot effectively be transmitted through the fill. Ice will not be present during higher water stages unless flashboards are deliberately added.

Case 3 - Half PMF pool at EL 1007.0 or 7 feet above spillway crest (1.75 feet above top of dam), flood tailwater estimated at 1.7 feet deep or 7.8 feet below spillway crest (below failure plane for dam), full headwater and tailwater uplift, remaining conditions same as Case 1.

Case 4 - Full PMF pool at EL 1009.7 or 9.7 feet above spillway crest (4.45 feet above top of dam), tailwater estimated at 2.5 feet deep or 7 feet below spillway crest (below failure plane for dam), remaining conditions same as Case 3.

The results of the stability analysis are summarized in Table 6.1. The computations are included starting on Appendix D-1 for the spillway and on Appendix D-9 for the dam.

For all loading cases analyzed, minimum satisfactory overturning stability is considered to be a factor of safety of 1.5 with the resultant passing through the middle third of the base. For sliding stability, because of the high loading conditions and the conservative assumptions made about foundation material properties, a minimum satisfactory factor of safety of 2.0 is considered appropriate for all the loading cases analyzed, rather than the customary

TABLE 6.1

CAPE POND DAM

STABILITY ANALYSIS OF GRAVITY SECTIONS

CASE	OVERTURNING		SLIDING FACTOR OF SAFETY (c)
	FACTOR OF SAFETY (a)	LOCATION OF RESULTANT (b)	
Spillway Section			
1- Normal Pool	1.93	0.46b	>10 effectively
2- Normal Pool plus Ice Load	Ice load not applicable, see text.		
3- Half PMF Pool	1.15 unsatisfactory	0.12b	1.50 unsatisfactory
4- Full PMF Pool	1.02 unsatisfactory	0.02b	1.18 unsatisfactory
Dam Section			
1- Normal Pool	4.75	0.42b	5.72
2- Normal Pool plus Ice Load	Ice load not applicable, see text.		
3- Half PMF Pool	0.94 unstable	-0.04b	1.39 unsatisfactory
4- Full PMF Pool	0.61 unstable	-0.34b	0.98 unstable

(a) Overturning factor of safety is ratio of resisting moments to driving moments taken about the toe.

(b) Distance from toe to point where resultant passes through base, expressed in terms of base dimension "b". Middle third of base is 0.33b to 0.67b.

(c) Sliding factor of safety is ratio of resisting forces to driving forces taken along horizontal failure plane.

3.0. Both overturning and sliding stability must be satisfactory in order for stability of the section to be satisfactory.

As noted from Table 6.1, for 1/2 PMF and PMF conditions (Cases 3 and 4) the spillway has unsatisfactory stability and the dam section is unstable. For normal spring-summer-fall conditions (Case 1), both the spillway and dam appear to have satisfactory stability.

For cases 3 and 4, the 1/2 PMF and PMF conditions, it should be noted that the full weight of the flowing water on the face of the sections was taken into account as a resisting force. Considering the relatively steep faces of the sections and the high head and discharge for the 1/2 PMF and PMF conditions, it is probable that the flowing water would exert little to no pressure - or even negative pressure - on the faces of the sections. Therefore, actual stability of the spillway and dam under such flood conditions might be even more unsatisfactory than presently indicated.

In view of the apparent unsatisfactory stability of the spillway and the instability of the dam, it is recommended that a detailed structural stability investigation of the dam and spillway be conducted to better assess their stability under flood loading conditions. This should include appropriate field and laboratory work to determine actual foundation material properties and structural details, including accurate cross sections of the dam and spillway. The investigation should determine what modifications to the dam and spillway, if any, are necessary to achieve satisfactory stability.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

Visual inspection of Cape Pond Dam revealed the following deficiencies which affect the safety of the dam:

1) Seepage passing through joints in the spillway section.

2) Trees and brush growing on the embankment portions of the dam, in the zone adjacent to the downstream toe, and in the area between the spillway and the natural stream channel.

3) Deteriorated concrete and stone masonry of the gravity dam section, the spillway, and the spillway training walls.

4) Deterioration of the riprap apron downstream of the spillway.

5) Deterioration of one of the joints of outlet pipe # 1.

Hydrologic and hydraulic analysis indicates that maximum spillway discharge capacity is only about 21% of the PMF peak outflow. The 1/2 PMF would overtop the concrete and stone masonry dam. Structural stability analysis, indicates that overtopping due to 1/2 PMF would probably cause failure of the dam. It is judged that failure due to overtopping would significantly increase the hazard to loss of life downstream from that which would exist just prior to failure. Therefore, in accordance with Corps of Engineers' screening criteria for review of spillway adequacy, spillway capacity is considered "seriously inadequate" and the dam is assessed as "unsafe, non-emergency".

Structural stability analysis indicates that for the 1/2 PMF and PMF conditions the spillway has unsatisfactory stability and the dam section is unstable. For normal spring-summer-fall conditions both the spillway and dam appear to have satisfactory stability.

b. Adequacy of Information

Available information together with that gathered during the visual inspection, while considered adequate for this Phase I inspection, is deficient in the following respects:

73

1) Trees, brush, and debris on the downstream side of the dam prevent adequate inspection of that area.

2) The gravity spillway section is assumed to be concrete and grouted masonry as shown on Appendix G-1. The design at other sections and the footing elevations are not known. There is also no data available on the actual material properties of the soil foundation under the concrete and stone masonry dam and the spillway. The lack of such data critically affects the structural stability analysis of the dam and spillway.

3) Minor inconsistencies in the engineering data available, based on field observation and checking, are itemized in Section 2.4c.

c. Need for Additional Investigations

The following detailed engineering investigations should be performed by a registered professional engineer qualified by training and experience in the design of dams:

1) Perform a detailed hydrologic and hydraulic analysis to better assess spillway adequacy. This should include a more accurate determination of the site specific characteristics of the watershed.

2) Perform a detailed structural stability analysis of the dam and spillway to better assess their stability under flood loading conditions. This should include appropriate field and laboratory work to determine actual foundation material properties and structural details, including accurate cross sections of the dam and spillway.

3) Observe the flow through and over the spillway at the right training wall of the spillway during periods of high water (6 inches or more of flow over the spillway) to determine whether alterations or repairs may be required in this vicinity.

d. Urgency

As recommended below in Section 7.2a, a program to visually inspect the dam at least once a month should be instituted immediately. As recommended below in Section 7.2b, development of a surveillance program and an emergency action plan should be completed within 3 months after receipt of this Phase I Inspection Report by the Owner. While the action plan is being developed, and within 3 months after receipt of this report by the Owner, the investigations recommended above in Section 7.1c should be started.

Any remedial work deemed necessary as a result of these investigations should be completed within 18 months after receipt of this report by the Owner.

Measures recommended below in Section 7.2c should be completed wtihin 12 months after receipt of this report by the Owner.

7.2 RECOMMENDED MEASURES

The following work should be performed by the Owner. Where engineering assistance is indicated, the Owner should engage a registered engineer qualified by training and experience in the design of dams. Assistance by such an engineer may also be useful for some of the other work.

a. Complete Immediately

Institute a program to visually inspect - not just casually look at - the dam and its appurtenances at least once a month.

b. Complete Within 3 Months

Develop a surveillance program for use during and immediately after heavy rainfall or snowmelt, and also an emergency action plan outlining action to be taken to minimize the downstream effects of an emergency, together with an effective warning system.

c. Complete Within 12 Months

1) Seal the upstream side of the gravity section to reduce the quantity of and the pressure head due to seepage through it. Provide drainage facilities for such seepage that does occur.

2) Contingent on the results of the detailed hydrologic and hydraulic analysis and the detailed structural stability analysis, repair the deteriorated concrete and stone masonry of the gravity dam section, the spillway, and the spillway training walls.

3) Remove trees and brush and their root systems from the embankment, from a zone 15 feet wide next to the downstream toe, and from the area between the spillway and the natural stream channel in accordance with specifications and field observation of the work by an engineer. Backfilling the zones where stumps and roots have been removed should be done with proper material and procedures. Continue to keep these same areas clear by cutting, mowing, and cleanup at least annually.

4) Repair the riprap apron downstream of the spillway.

5) Repair the deteriorated joint in outlet pipe # 1 to prevent water from leaking out of the pipe into the area of the downstream rockfill.

6) Develop and implement effective routine operation and maintenance procedures for the dam and its appurtenances. The outlet pipe gates should be exercised regularly.

7) Institute a program of comprehensive technical inspection of the dam and its appurtenances by an engineer on a periodic basis of at least once every two years.

d. Complete Within 18 Months

The following remedial work should be completed by the Owner. A qualified, registered professional engineer should design and observe the construction of the remedial work.

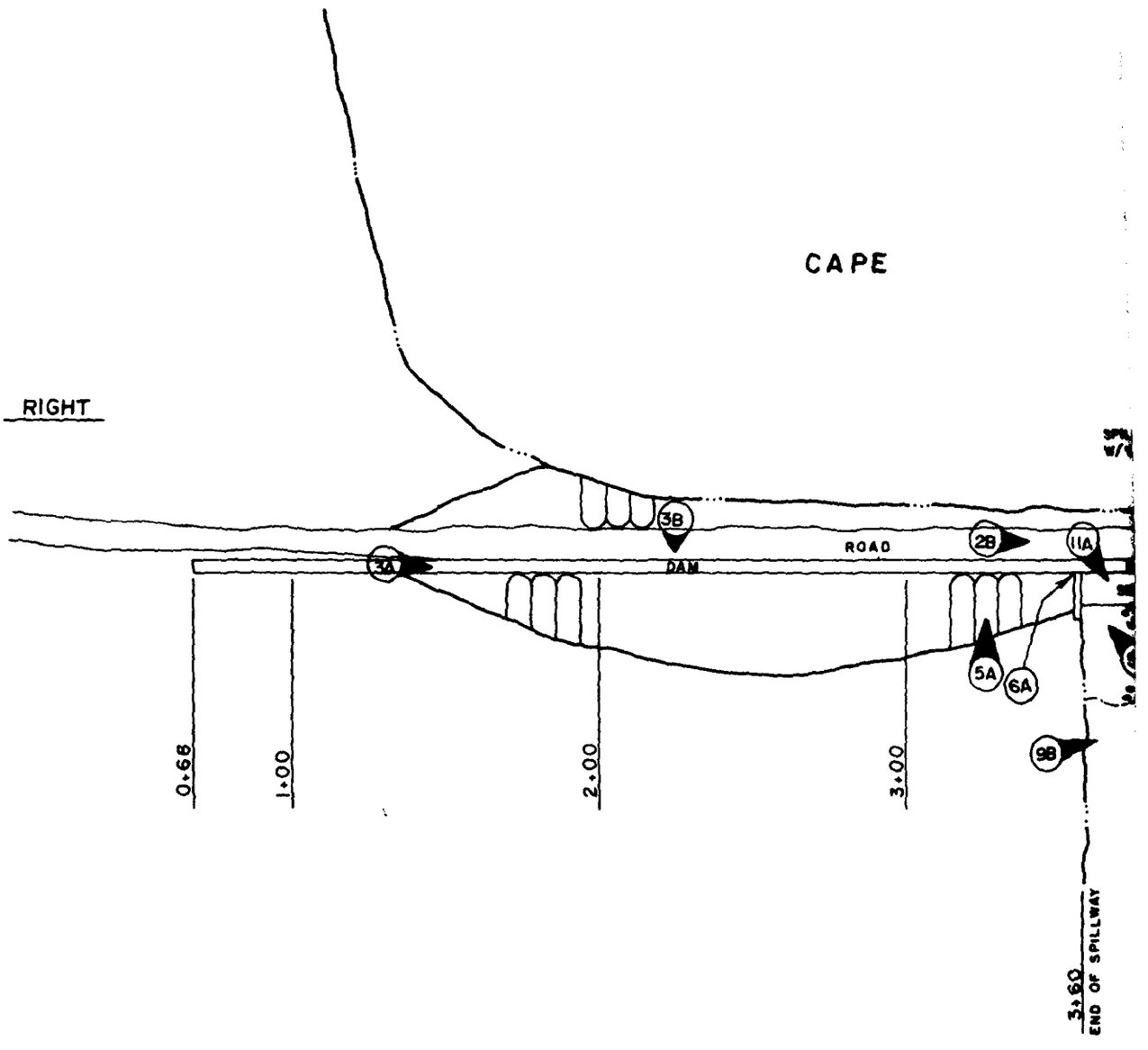
1) Appropriate modifications as a result of the detailed hydrologic and hydraulic analysis.

2) Appropriate modifications as a result of the detailed structural stability investigation of the dam and spillway.

3) Appropriate modifications as a result of observing flow over and through the spillway section at the right training wall of the spillway during periods of high water.

APPENDIX A

PHOTOGRAPHS


CAPE
RIGHT
3B
ROAD
2B
11A
3A
DAM
5A
6A
9B
0+66
1+00
2+00
3+00
3+60
END OF SPILLWAY

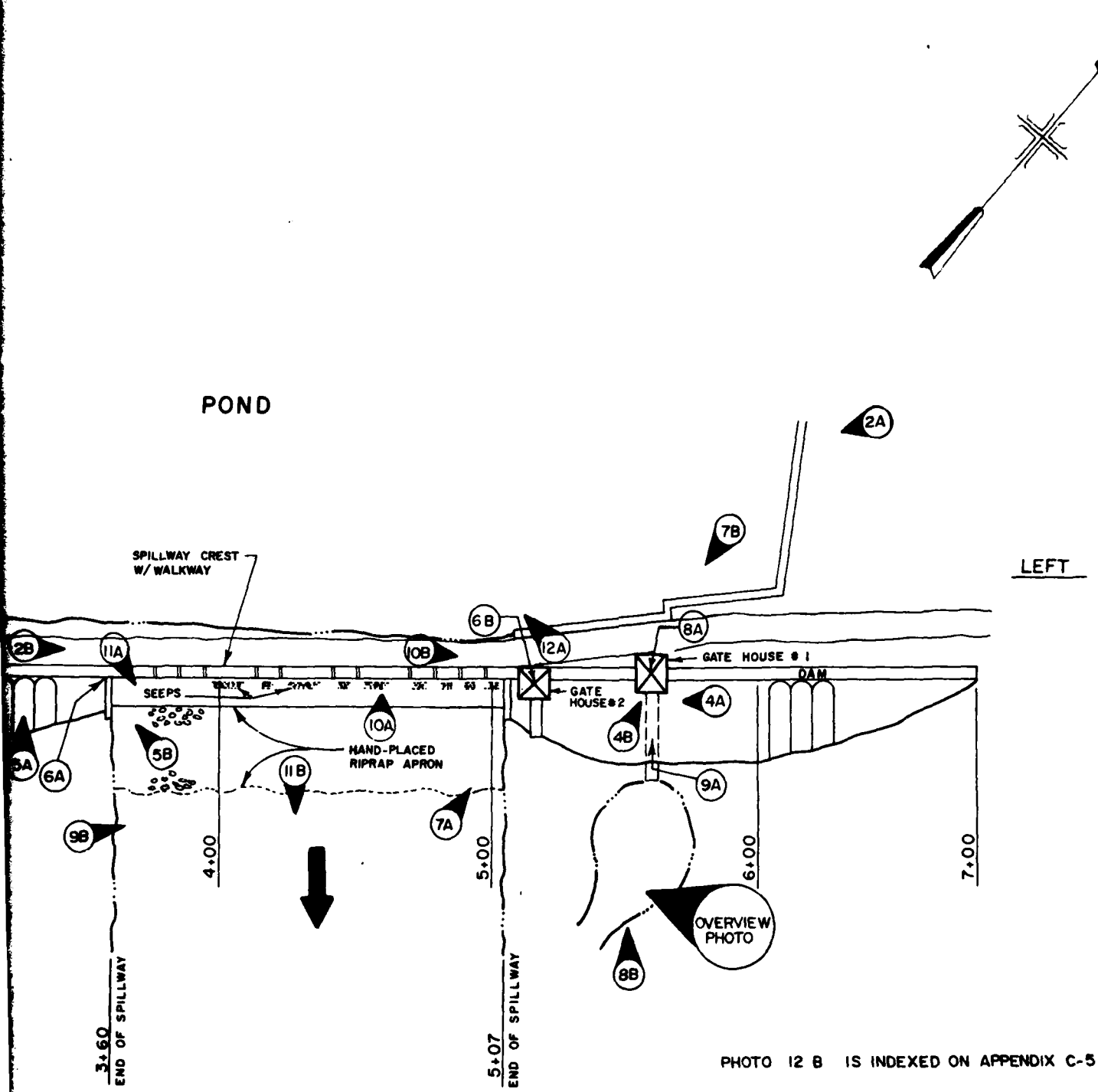
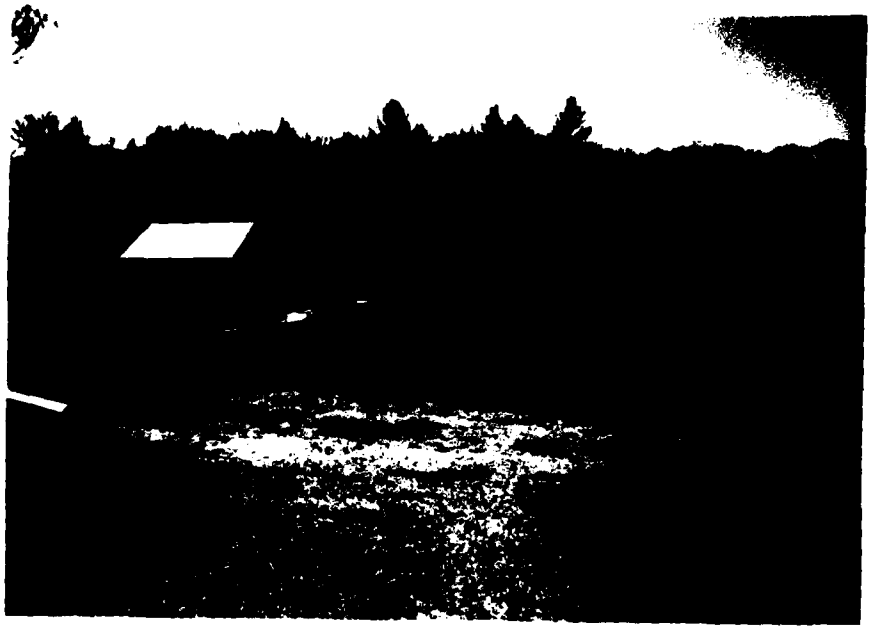


PHOTO 12 B IS INDEXED ON APPENDIX C-5.

CAPE POND DAM
PHOTO INDEX MAP

TOWN OF WAWARSING	ULSTER CO., N.Y.
SCALE: NONE	DATE JULY 1981

C.T. MALE ASSOCIATES, P.C.
JOHN TROY ROAD, SCHENECTADY, N.Y. 12309
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS



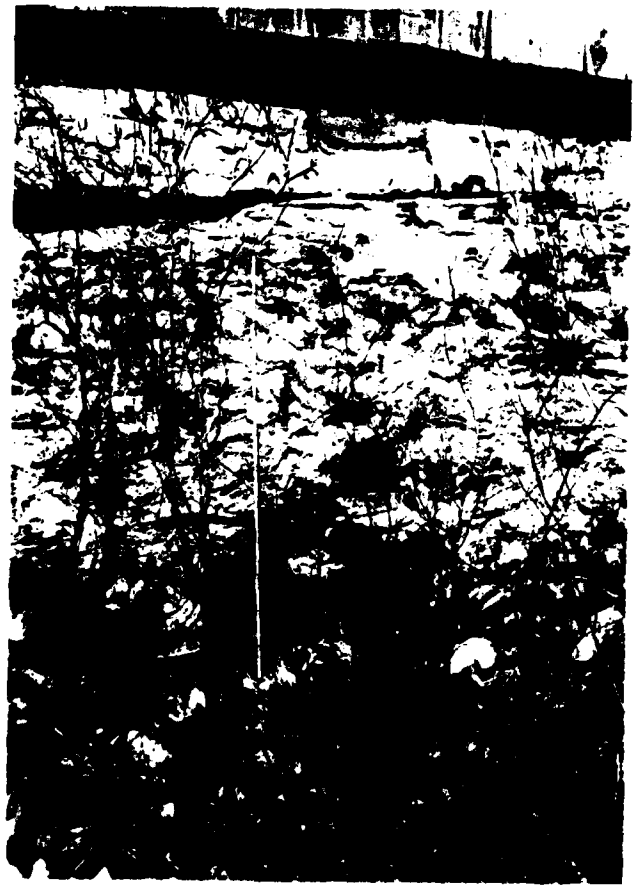
A-2A Dam from upstream looking toward right abutment - 4/8/81

A-2B Top of upstream rockfill roadway looking toward left abutment - 4/8/81

A-3A Top of concrete gravity section and downstream slope looking toward left abutment - 4/8/81

A-3B Deteriorated concrete on upstream side of gravity section, typical of the area to the right of the spillway - 4/8/81

A-4A View of rockfill berm on downstream side of concrete gravity section looking toward right abutment. Gate house No. 1 is in foreground; gate house No. 2 is in background - 4/8/81



A-4B Seep downstream of gate house No. 1. Note bottom of gate house siding - 4/8/81

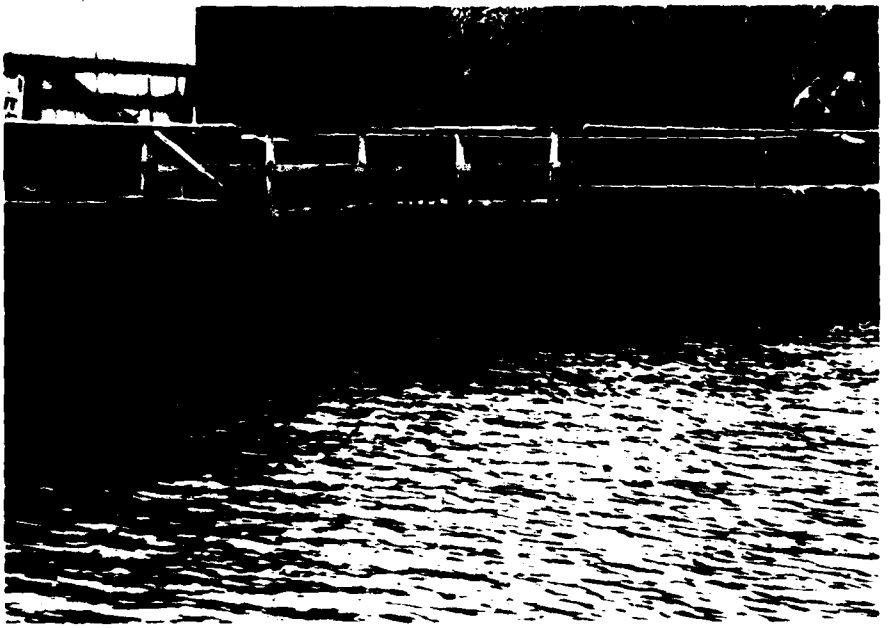
A-5A Seep at Sta 3 + 30 - 4/8/81

A-5B Right spilling training wall looking upstream, with rockfill behind it. Highest exposed portion of concrete gravity section is at left in the photo - 4/8/81

A-6A Crack at top of right spillway training wall - 4/8/81

A-6B Handwheel control mechanism for slide gate No. 2 - 4/8/81

A-7A Downstream end of outlet conduit for slide gate No. 2
4/8/81



A-7B Intake with trash rack upstream of gate No. 1 - 4/8/81

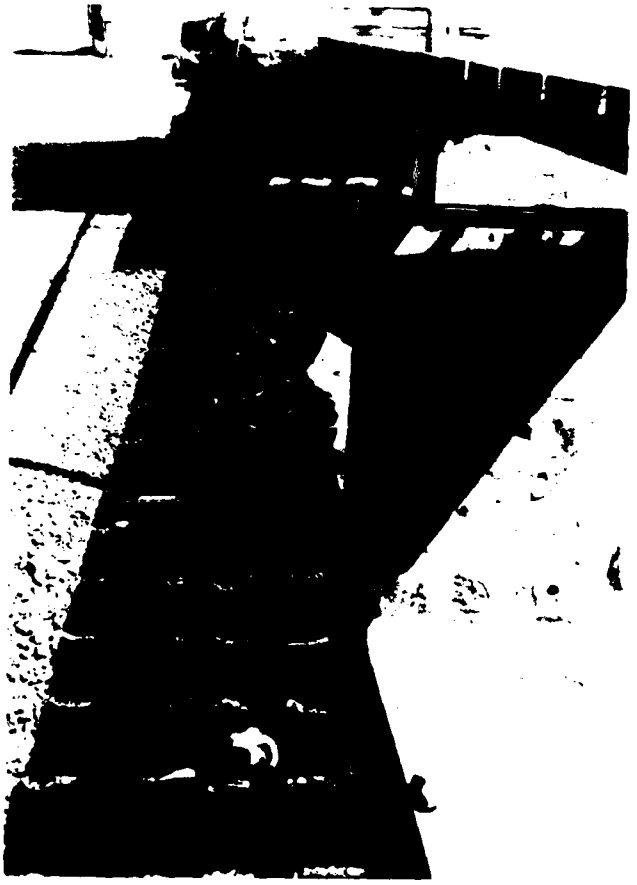
A-8A Handwheel control mechanism for slide gate No. 1 - 4/8/81

A-8B Downstream end of outlet conduit for slide gate No. 1 - 4/8/81

A-9A Inside of outlet conduit looking upstream at slide gate No. 1. Note gate leakage and gap in conduit joints - 4/8/81

A-9B Spillway and gate houses looking upstream toward left abutment. Note 3-foot drop in foreground at downstream edge of riprap apron - 4/8/81

A-10A Spillway with walkway looking downstream. Note seepage and condition of concrete - 4/8/81



A-10B Close-up of leftmost pier of spillway. Steel plate supporting downstream edge of roadway is barely visible at spillway crest 4/8/81

A-11A Spillway from walkway looking downstream. Note hand-placed riprap apron in discharge channel - 4/8/81

A-11B Spillway discharge channel looking downstream - 4/8/81

A-12A Reservoir looking upstream from left side of top of dam
4/8/81

A-12B Overview of Ulster Heights Lake Dam looking upstream
4/8/81

APPENDIX B

VISUAL INSPECTION CHECKLIST

PHASE I

VISUAL INSPECTION CHECKLIST

1. BASIC DATA

a. General

Name of Dam Cape Pond Dam

Fed. I.D.# NY00265 DEC Dam No. 751

River Basin LOWER HUDSON

Location: Town WAWARSING County ULSTER

Stream Name BEER KILL

Tributary of SANDBURG CREEK

Latitude (N) 41° 44.9' Longitude (W) 74°-26.3'

Type of Dam CONCRETE GRAVITY SECTION W/ ROCKFILLS U/S + D/S

Hazard Classification HIGH

Date(s) of Inspection APRIL 8, 1981

Weather Conditions SUNNY + WARM

Reservoir Level at Time of Inspection EL 999.9
(±1" LOWER THAN SPILLWAY CREST)

b. Inspection Personnel (*Recorder) THOMAS BENNEDUM - CTM,
EDWIN VOPELAK JR.* - CTM, STEVE J. POULOS* - GEI

c. Persons Contacted (Including Title, Address & Phone No.)
DAM OWNED BY CAPE POND, INC.
WILLIAM H. LYONS, PRESIDENT, LYONS RD., MILTON, N.Y. 12547, (914)-795-5164
ANDREW T. JACOB, OPERATOR, BOX 21A, CAPE RD., ELLENVILLE, N.Y. 12428, (914)-647-3207
SHERMAN B. LOUCKS, MEMBER, (914)-647-5254
THOMAS H. CLARK, MEMBER, (914)-562-6213

d. History
Date Constructed PRIOR TO 1904 Date(s) Reconstructed SPILLWAY 1914/16

Designer UNKNOWN

Constructed By MR. VANKEUREN, ELLENVILLE, N.Y. (DECEASED)

Owner CAPE POND INC., CAPE RD. ELLENVILLE, NY 12428
ATTN: WILLIAM H. LYONS, PRESIDENT, LYONS RD., MILTON, NY 12547

2. EMBANKMENT

a. Characteristics

GEI 1) Embankment Material Probably rockfill. Bin was chinked with 3/4 in. crushed stone to form roadway on surface. Lower portions may be large rockfill (Verbal from Mr Lyons)

GEI 2) Cutoff Type None known

GEI 3) Impervious Core Concrete gravity section is downstream of rockfill both at spillway and elsewhere. This portion is really the dam. Mr Lyons indicated that clay is dumped on the upstream side of the rockfill periodically.

GEI 4) Internal Drainage System None

GEI 5) Miscellaneous Reservoir is at full pressure against upstream side of concrete, since seeps from ogee spillway occur on downstream side only 2 ft below reservoir level.

GEI b. Crest

GEI 1) Vertical Alignment Surface of roadway slopes down to spillway and then up to access right side. Irregularity is ± 4 in but is of no consequence. Concrete weir is level.

GEI 2) Horizontal Alignment Upstream crestline is straight. Concrete portion is essentially straight.

GEI 3) Lateral Movement None observed

GEI 4) Surface Cracks None observed on embankment

GEI 5) Miscellaneous Roadway u.s. from left 3 bays of spillway is higher than spillway crest. Steel plates between concrete and roadway hold latter in place

GEI c. Upstream Slope

GEI 1) Slope (Estimate H:V) 3H:1V

GEI 2) Undesirable Growth or Debris, Animal Burrows

Minor. Grass and 2 ft high brush. No animal burrows.

GEI 3) Sloughing, Subsidence or Depressions None. Some irregularity in planeness of observable surface, most of which was underwater

GEI 4) Slope Protection Rockfill 3 to 10 in. size, relatively flat, sand-stone or limestone (gray). At spillway the stones near the top are up to 2 ft in long dimension.

GEI 5) Surface Cracks or Movement at Toe Concrete wall upstream on left side is cracked at Sta. 5+35, 5+45, 5+52, 5+60, 5+69. Offset of 7/8" at Sta 5+52.

GEI d. Downstream Slope

GEI 1) Slope (Estimate - H:V) Rt of spwy: flat to 3H:1V; Lt of left gate house: 6 ft wide rockfill berm. Between gatehouses: 4H:1V for 15 ft, then 1H:1V.

GEI 2) Undesirable Growth or Debris, Animal Burrows Trees growing from rockfills on left of spillway to 10 in. ϕ. Trees to 20 in. ϕ on right of spillway - fully forested.

GEI 3) Sloughing, Subsidence or Depressions Very irregular to right of spillway. Rockfill (3-10 in) placed to right of right ds. spillway training wall apparently to support wall, possibly because leakage had been observed in past.

GEI 4) Surface Cracks or Movement at Toe None observable

GEI 5) Seepage Sta 3+55 (40?) is lowest point where masonry on ds side is exposed to rt. of spillway. Oozing at 1 drop/sec. Ironstain, at 8 ft below crest wall (which is 14 ft above spillway crest. Masonry spalled at this location. Seepage from ds side of spillway at 0.5 ft, 1-2 ft and 8 ft below crest Sta 5+10 to 3+70. Seepage of a few drops per second ds side of rt gate house at 18 in. below spwy crest (just below its foundation concrete) One drop per second ds of left gatehouse.

GEI 6) External Drainage System (Ditches, Trenches, Blanket)

None

GEI 7) Condition Around Outlet Structure Seep noted in 5) is 3 ft above the right outlet structure ds of gate house.

GEI 8) Seepage Beyond Toe None observed

GEI e. Abutments - Embankment Contact

Good right and left, upstream and downstream

GEI 1) Erosion at Contact None observed.

GEI 2) Seepage Along Contact None observed.

3. DRAINAGE SYSTEM

GEI a. Description of System None.

GEI b. Condition of System N.A.

GEI c. Discharge from Drainage System N.A.

4. INSTRUMENTATION (Monumentation/Surveys, Observation Wells, GEI Weirs, Piezometers, Etc.) None

5. RESERVOIR

GEI a. Slopes Flat 5H:1V or less. Forested with hardwoods except for a few (apparently planted) white pines near camps along shore.

GEI b. Sedimentation Pond is only 4 ft deep, according to Mr. Lyons.

GEI c. Unusual Conditions Which Affect Dam None noted

6. AREA DOWNSTREAM OF DAM

a. Downstream Hazard (No. of Homes, Highways, etc.) NOTHING MAJOR NEAR STEAM FOR 2± MILES. THEN VARIOUS DWELLINGS & STREAM RUNS THROUGH VILLAGE OF ELLENVILLE, ROAD W/ BRIDGE CROSSING 2200'± D/S OF DAM

GEI b. Seepage, Growth Brush and 3-10 in. ϕ trees within 100 ft from spillway. Forested natural stream further downstream.

GEI c. Evidence of Movement Beyond Toe of Dam None

d. Condition of Downstream Channel BRUSH & TREES D/S OF SPILLWAY OUTLET PIPE CHANNELS, BRUSH AND TREE ENCROACHMENT OF CHANNEL D/S 100' FROM SPILLWAY, NATURAL CHANNEL MUCH NARROWER THAN SPILLWAY OPENING & BECOMES STEEP FURTHER DOWNSTREAM

7. SPILLWAY(S) (Including Discharge Channel)

a. General OGEE-LIKE OVERFLOW SPILLWAY W/ ABOUT 4' CREST WIDTH & 11 PIERS FOR WALKWAY, EACH ABOUT 1' WIDE. TOTAL WIDTH 147' (136' W/O PIERS) ALSO REMAINS OF FLASHBOARD HINGES & PIN SOCKETS WHICH ARE NO LONGER FUNCTIONAL. OGEE-LIKE SECTION D/S W/ STONE (LEFT) & CONC. (RIGHT) TRAINING WALLS & HAND-PLACED ROCK RIPRAP DISCHARGE AREA AT D/S END FOR ABOUT 30'. ALSO ROCKFILL W/ 6' WIDE CREST AT WEIR CREST APPROACH

b. Conditon of Service Spillway GENERALLY FAIR, D/S OF "OGEE" CONCRETE SPALLED & CRACKED (COLD JOINTS), SOME GUNITING OF SURFACE WAS DONE, BUT NOW IT IS FLAKING & FALLING OFF. SEEPAGE THROUGH SECTION (SEE 9.g), D/S END OF OGEE BREAKING UP & SOME CONCRETE EROSION ON D/S SIDE. PIERS ON WEIR CREST HAVE CRACKED CONCRETE, SPALLS, POPOUTS 1" TO 3" DIA, EFFLORESCENCE, 3 PIERS SEEM TO HAVE BEEN REMOVED

c. ~~Condition of Auxiliary Spillway~~ WEIR CREST HAS SEVERAL TRANSVERSE CRACKS FROM U/S TO D/S SIDE AT CREST, FIRST BAY ON LEFT SIDE IS BADLY SPALLED. RIGHT TRAINING WALL HAS CRACK (2"± WIDE) AT BEND POINT, RANDOM CRACKING & EFFLORESCENCE

c. CONDITION OF AUXILIARY SPILLWAY - N/A.

d. Condition of Discharge Channel SOME DETERIORATION OF HAND-PLACED RIPRAP AT D/S END, SOME OF RIPRAP IS MISSING OR DISTURBED, BRUSH + TREES D/S OF PAVING

8. RESERVOIR DRAIN/OUTLET PIPE 1 (NEAREST LEFT ABUTMENT)

a. Type: Pipe ✓ Conduit _____ Other _____

b. Material: Concrete _____ Metal ✓ Other _____

c. Size: 48" DIA Length 35'

d. Invert Elevations: Entrance 986.8 Exit 986.8

e. Physical Condition (Describe)

Unobservable _____

1) Material RIVETED STEEL PIPE D/S OF CONCRETE WALL

2) Joints JOINT 10' FROM END OPENED ABOUT 1' Alignment JOINT 10' FROM END OFFSET 4"±

3) Structural Integrity PIPE JOINT 10' FROM END OPEN 1', PIPE RUSTING & PITTING, APPEARS ADEQUATE

4) Hydraulic Capability GOOD, SOME TAILWATER AT D/S END

f. Means of Control: Gate ✓ Valve ___ Uncontrolled ___

Operation: Operable ✓ Inoperable ___ Other _____

Present Condition (Describe) HANDWHEEL CONTROL FOR RAISING GATE STEM PROTECTED BY LOCKED GATE HOUSE, GEARING WELL LUBRICATED, OPERATES EASILY & OPERATED REGULARLY

g. Other Outlets (water mains, diversion pipes) _____

SEE NEXT PAGE FOR OUTLET PIPE 2

d. Condition of Discharge Channel _____

8. RESERVOIR DRAIN/OUTLET PIPE 2 (NEAREST SPILLWAY)

a. Type: Pipe ✓ Conduit _____ Other _____

b. Material: Concrete _____ Metal ✓ Other _____

c. Size: 48" DIA Length 20'

d. Invert Elevations: Entrance 991.4 Exit 991.4

e. Physical Condition (Describe)

Unobservable _____

1) Material RIVETED STEEL PIPE D/S OF CONCRETE WALL

2) Joints OKAY Alignment GOOD

3) Structural Integrity PIPE RUSTING & PITTING, PIPE RUSTED THROUGH BOTTOM @ D/S END OF LITTLE CONSEQUENCE, APPEARS ADEQUATE

4) Hydraulic Capability GOOD, FREE DISCHARGE @ D/S END

f. Means of Control: Gate ✓ Valve ____ Uncontrolled ____

Operation: Operable ✓ Inoperable ___ Other _____

Present Condition (Describe) HANDWHEEL CONTROL FOR RAISING GATE STEM PROTECTED BY LOCKED GATE HOUSE, GEARING WELL LUBRICATED. OPERATES HARDER THAN GATE 1, OPERATED WHEN REQUIRED DURING HIGH FLOW PERIODS

g. Other Outlets (water mains, diversion pipes) _____

N/A

9. STRUCTURAL

a. Concrete Surfaces TOP 4' OF GRAVITY SECTION (CORE WALL) ON U/S + D/S SIDES IS BADLY ERODED (AS DEEP AS 1'), DETERIORATED, + SCALED. CAP WAS REPAIRED IN SEVERAL PLACES, SURFACE COATING OF GUNITE ON CONCRETE ON D/S SIDE OF OGEE IS CRACKING, PEELING, + SPALLING OFF.

b. Structural Cracking SEE c.5). PIER CRACKED, PROBABLY TO EXSPANSION + CONTRACTION OF WALKWAY PIPE SUPORTS ALSO CRACKS (COLD JOINTS) IN D/S SIDE OF OGEE SECTION + IN RIGHT TRAINING WALL NEAR CREST AT BEND POINT

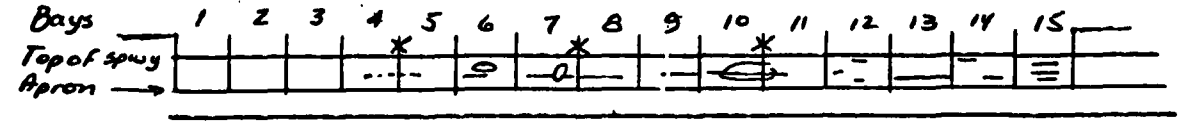
c. Movement - Horizontal & Vertical Alignment(Settlement) SEE c.5). D/S SIDE OF PIER UP TO 0.2' LOWER THAN U/S SIDE, MAY HAVE BEEN POURED THIS WAY

GEI d. Junctions with Abutments or Embankments Appears to have been seepage in past to right of rt ds training wall, because of hole beneath rockfill at ds toe. Training wall is cracked and flow could easily enter rockfill through these cracks during spillway overflow

GEI e. Drains - Foundation, Joint, Face None

f. Water Passages, Conduits, Sluices WATER PASSAGES ARE RIVETED STEEL PIPE D/S W/ SLIDE GATES AT CONCRETE WALL SECTION, SOME LEAKAGE AT GATE WHEN CLOSED, U/S APPROACHES TO GATES SUBMERGED + UNOBSERVABLE

GEI g. Seepage or Leakage



---- Seeps O patches or spalls X missing flashboard pier.

Looking upstream

h. Joints - Construction, etc. SEEPAGE ON D/S SIDE OF OGEE IS ALONG HORIZONTAL LINES, PROBABLY AT CONSTRUCTION JOINTS.

GEI i. Foundation Best guess- glacial till.

GEI j. Abutments Good condition. Probably glacial till.

k. Control Gates NONE BUT GATES ON OUTLET PIPES.

l. Approach & Outlet Channels SPILLWAY APPROACH IS ROCKFILL BERM GRADUALLY SLOPING UP TO ITS 10' CREST WIDTH AT SPILLWAY CREST. D/S CHANNEL OF SPILLWAY MUCH NARROWER THAN SPILLWAY W/ TREES & BRUSH ALONG CHANNELS, OUTLET PIPE APPROACHES ARE ABOUT 10' WIDE W/ CONC. SIDE WALLS & BRIDGE DECK ACCROSS TOP. D/S END OF PIPE #1 HAS PONDING AREA & THEN FLOWS TO STREAM D/S END OF #2 HAS DISCHARGE TO AREA NEXT TO SPILLWAY & THEN FLOWS TO STREAM D/S OF SPILLWAY

m. Energy Dissipators (Plunge Pool, etc.) PONDING AREA W/ RIPRAP & STONE WALLS AT END OF PIPE #1, RIPRAPED AREA AT END OF PIPE #2, & HAND PLACED RIPRAP FOR 30' AT D/S TOE OF OGEE

n. Intake Structures CRUDE WOODEN TRASH RACKS (MADE OF 1" TO 2" STICKS W/ 1' OPENINGS AT U/S END OF 10' WIDE OPENINGS IN AN U/S CONCRETE WALL. WOOD BRIDGE DECKS ACCROSS TOP OF INTAKE AREAS, THROUGH UPSTREAM ROCKFILL.

o. Stability

p. Miscellaneous

10. APPURTENANT STRUCTURES (Power House, Lock, Gatehouse, Service Bridge, Other)

a. Description: WALKWAY ACROSS SPILLWAY SECTION, 2 GATE HOUSES ON DAM SECTION, ALL IN LINE WITH CONCRETE GRAVITY SECTION OF DAM, 2 - WOODEN BRIDGE DECKS OF 2"x4" BOARDS ACCROSS INTAKES TO SLIDE GATES, A PADLOCKED GATE ACCROSS ROCKFILL AT U/S SIDE OF GRAVITY SECTION CONTROLS ACCESS TO DAM.

GATE HOUSE #1 - WOOD FRAME STRUCTURE W/ STEEL ROOF + 2 LOCKABLE DOORS

GATE HOUSE #2 - WOOD FRAME STRUCTURE W/ ASPHALT SHINGLE ROOF & 2 LOCKABLE DOORS

WALKWAY - STEEL PIPE STRUCTURE W/ WOODEN DECKING SET ON PIERS IN SPILLWAY THAT CROSSES SPILLWAY OPENING

b. Condition: GATE HOUSE #1 - GOOD CONDITION

GATE HOUSE #2 - GOOD CONDITION, ROOF LEAKS

WALKWAY - GOOD CONDITION, STEEL PIPING NEEDS PAINTING, DECKING UNPAINTED, PIER SUPPORT CONC. FAIR (SEE 7.b.)

BRIDGES OVER INTAKES ARE UNPAINTED BUT IN GOOD CONDITION

11. MISCELLANEOUS MECHANICAL/ELECTRICAL EQUIPMENT

a. Description: POWER FOR LIGHTING INSIDE 2 GATE HOUSES

b. Condition: LIGHTS IN GATE HOUSES WORK

12. OTHER

72.

APPENDIX C

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

CHECKLIST AND COMPUTATIONS

TABLE OF CONTENTS

	Page
Hydrologic and Hydraulic Engineering Data Checklist	C-1
Drainage Area Map	C-5
Drainage Areas	C-6
Drainage Area Data for HEC-1 DB Model	C-7
Ulster Heights Lake	
Elevation - Area - Storage Computations	C-9
Discharge Computations	C-10
Drainage Area Routing	
Cross Sections of Subarea 3 Channel	C-11
Cape Pond	
Elevation - Area - Storage Computations	C-12
Discharge Computations	C-13
Overtopping Analysis	
Computer Input	C-16
Computer Output - Complete	C-18
Inflow and Outflow Hydrograph plots	C-26

4595

PHASE I INSPECTION

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA CHECKLIST

Name of Dam CAPE POND DAM Fed. Id.# NY00265

1. AREA-CAPACITY DATA

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
a. Top of Dam	1005.25	448 EST.	3,605
b. Design High Water (Max. Design Pool)	UNKNOWN		
c. Auxiliary Spillway Crest	N/A		
d. Pool Level with Flashboards	N/A (FLASHBOARD SUPPORTS NOW UNUSABLE)		
e. Service Spillway Crest	1000	229.6	1,377

2. DISCHARGES

	Volume (cfs)
a. Average Daily	UNKNOWN
b. Spillway @ Top of Dam	4,890
c. Spillway @ Design High Water	UNKNOWN
d. Service Spillway @ Auxiliary Spillway Crest Elevation	N/A
e. Low Level Outlets * COMBINED CAPACITY, W.S. AT TOP OF DAM	450
f. Total (of all facilities) @ Top of Dam	5,340
g. Maximum Known Flood AUGUST 1955 DAM OVERTOPPED EARLY 1970's DAM OVERTOPPED WHEN ULSTER HEIGHTS LAKE DAM U/S FAILED	>4,900 EST.
h. At Time of Inspection	~ 25 cfs

* DAM HAS 2 OUTLET PIPES:
OUTLET PIPE 1: INV. EL 986.8 : CAPACITY W/ W.S. @ TOP OF DAM 240 cfs
OUTLET PIPE 2: INV. EL 991.4 : CAPACITY W/ W.S. @ TOP OF DAM 210 cfs

4596

3. TOP OF DAM

Elevation 1005.25

a. Type EARTH FILL W/ MASSIVE CONCRETE CORE WALL PARTIALLY EXPOSED, CONC. GRAVITY SPILLWAY SECTION, PERVIOUS ROCK FILL U/S OF DAM

b. Width COREWALL 4' U/S ROCK FILL 10' Length 612' (465' W/O SPILLWAY)

c. Spillover SERVICE SPILLWAY

d. Location ABOUT AT CENTER OF DAM

4. SPILLWAY

	SERVICE	AUXILIARY
a.	1000 (FROM 1976 MYSDOT TOPO QUAD) Elevation	NONE
b.	OGEE-LIKE OVERFLOW Type	
c.	147' (INCLUDES 11 PIERS @ 1' EACH) Width	

Type of Control

d. ✓ Uncontrolled

e. REMAINS OF FLASHBOARD HINGES + PIN SOCKETS Controlled: Type (Flashboards; gate)

f. Number

g. Size/Length

h. CONCRETE Invert Material

i. Anticipated Length of Operating Service

j. ABOUT 10' FROM SPILLWAY CREST TO D/S ROCK PAVING Chute Length

k. ~11' Height Between Spillway Crest & Approach Channel Invert (Weir Flow)

l. Other

4597

5. OUTLET STRUCTURES/EMERGENCY DRAWDOWN FACILITIES

a. Type: Gate____ Sluice____ Conduit ✓ Penstock____

b. Shape 2 RIVETED STEEL PIPES W/ SLIDE GATES AT COREWALL END

c. Size 2-48"DIA LENGH OUTLET PIPE1: 35' LENGTH OUTLET PIPE 2: 20'

d. Elevations: Entrance Invert OUTLET PIPE 1: ~986.8 OUTLET PIPE 2:~991.4

Exit Invert OUTLET PIPE 1: 986.8 OUTLET PIPE 2: 991.4

e. Tailrace Channel: Elevation OUTLET PIPE 1: ~986 OUTLET PIPE 2: ~986

6. FLOOD WATER CONTROL SYSTEM

a. Warning System NONE

b. Method of Controled Releases (mechanisms) GATES ON OUTLET PIPES 1 & 2 CAN BE OPERATED. GATE ON OUTLET PIPE ONE IS USED FOR NORMAL OPERATION

7. CLIMATOLOGICAL GAGES REFERENCE 21 & 22

a. Type RECORDING & NON-RECORDING PRECIPITATION GAGE INDEX # 2582

b. Location VILLAGE OF ELLENVILLE LAT. 41°43', LONG. 74°24'

c. Period of Record 1944 TO PRESENT (ABOUT 2 MILES FROM DAM)

d. Maximum Reading UNKNOWN Date____

8. STREAM GAGES REFERENCE 24

a. Type SURFACE WATER STATION USGS GAGE # 01366650

b. Location SANDBURG CREEK AT ELLENVILLE

LAT. 41°42'54", LONG. 74°23'21", ~ 4 MILES S.E. OF DAM

c. Period of Record APRIL 1957 TO 1977

d. Maximum Reading 4,660 cfs = 82.2 cms Date AUG. 19, 1960

DA. = 56.7 sq. mi.

9. OTHER

6169

10. DRAINAGE BASIN CHARACTERISTICS

a. Drainage Area 19.251 SQ. MILES OR 12,320.3 ACRES

b. Land Use - Type RURAL - RESIDENTIAL, UPLAND SWAMPY AREAS

c. Terrain - Relief FLAT AREAS + AREAS W/ SLOPES TO 20% ELEVATIONS FROM EL 1000 TO EL 1840

d. Surface - Soil GLACIAL TILL

e. Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

MODIFICATIONS TO UPSTREAM RESERVOIR (ULSTER HEIGHTS LAKE). THE DAM ON ULSTER HEIGHTS LAKE HAS FAILED IN THE PAST.

f. Potential Sedimentation Problem Areas (natural or man-made; present or future)

NONE.

g. Potential Backwater Problem Areas for Levels at Maximum Storage Capacity (including surcharge storage)

NONE NOW KNOWN. IN EARLY 1900's PROBLEMS CAUSED BY USE OF FLASHBOARDS (NOW NO LONGER USED)

h. Dikes - Floodwalls (overflow & non-overflow) - Low Reaches Along the Reservoir perimeter

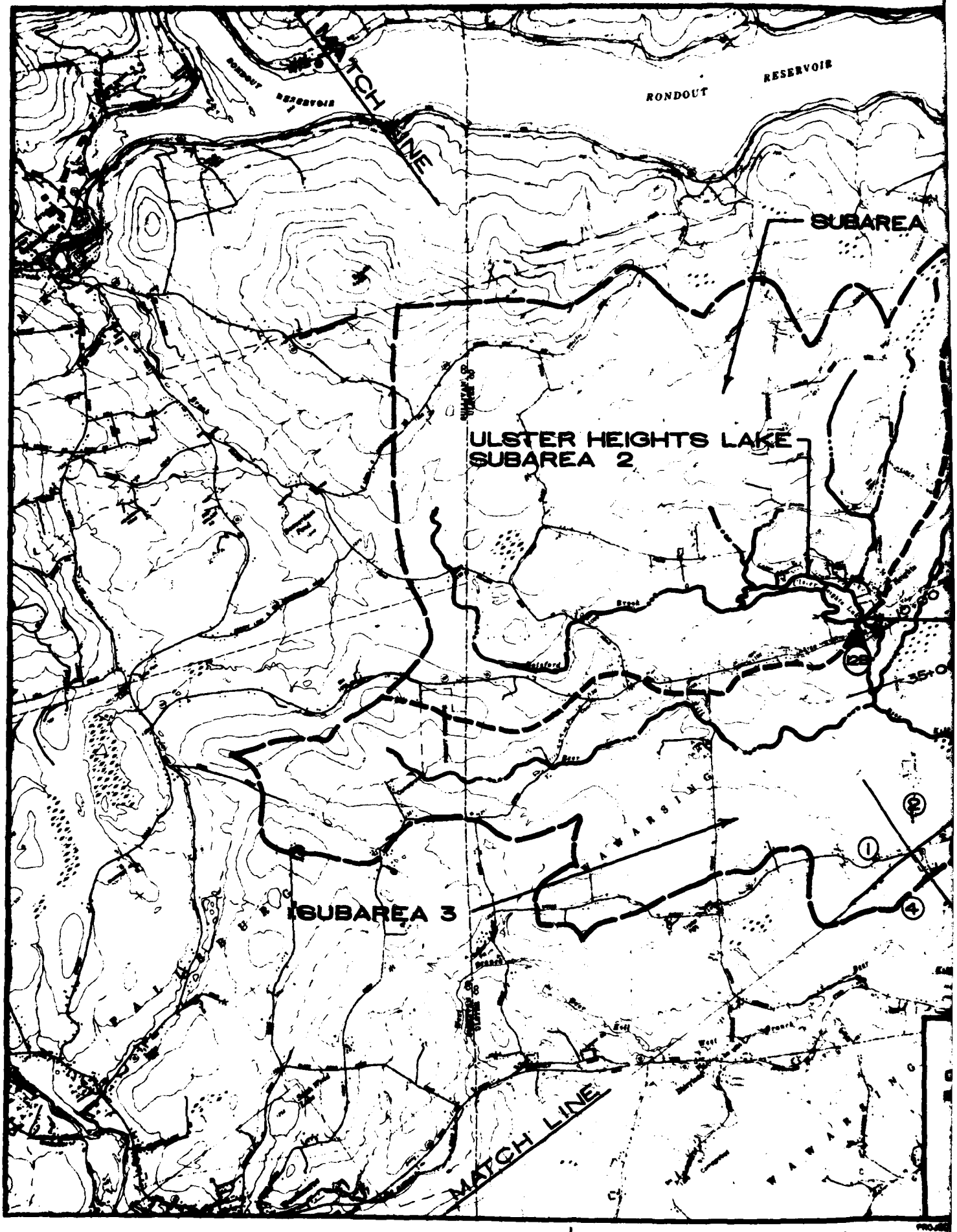
Location N/A

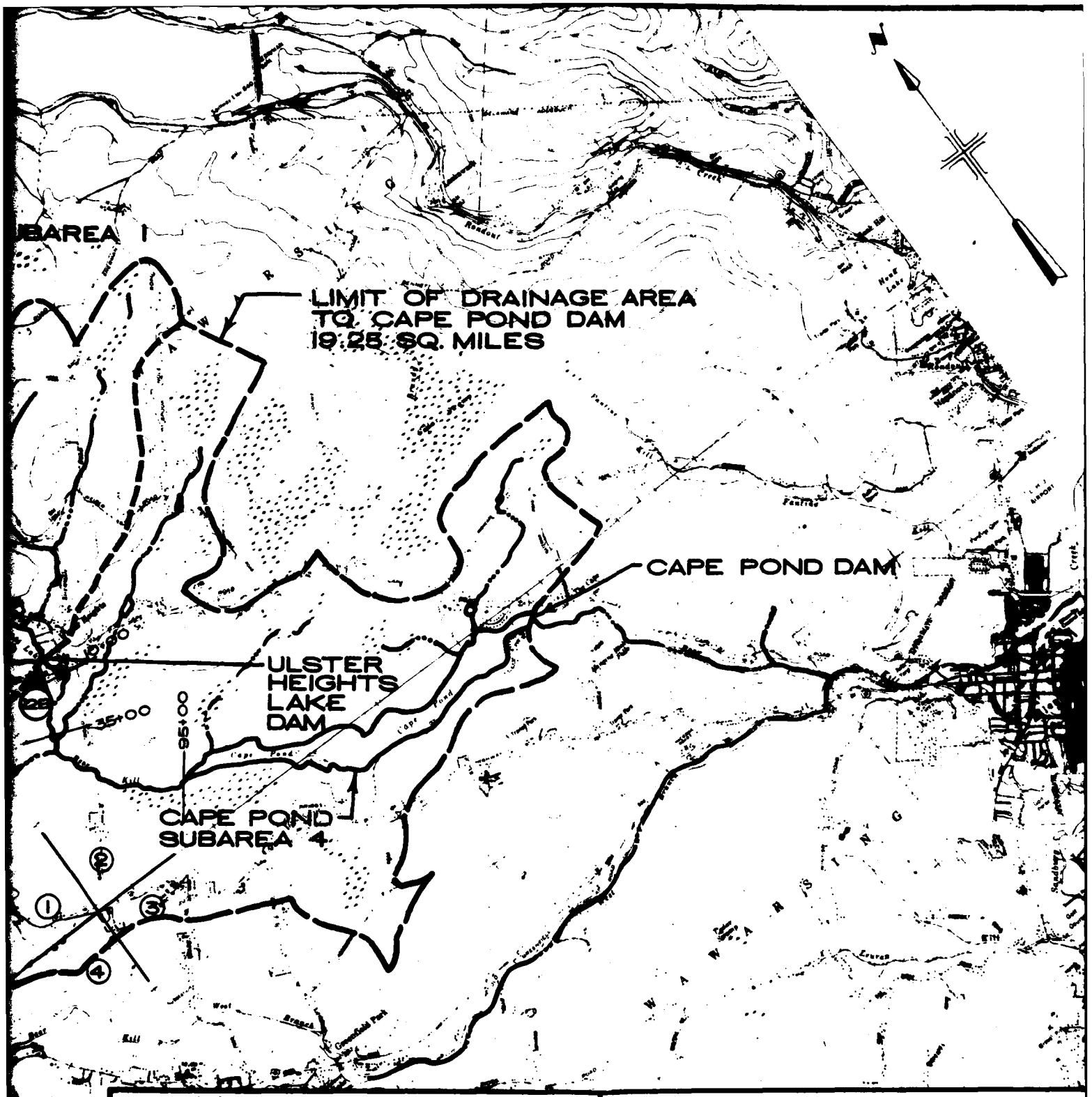
Elevation

i. Reservoir

Length @ ~~Maximum Design~~ SPILLWAY CREST Pool ~6300' (AT SPILLWAY CREST) (feet)

Length of Shoreline (@ ~~Service~~ Spillway Crest) ~28,500 (feet)


RONDOUT RESERVOIR
RONDOUT RESERVOIR
MATCH LINE
SUBAREA
ULSTER HEIGHTS LAKE
SUBAREA 2
SUBAREA 3
MATCH LINE



CAPE POND DAM
DRAINAGE AREA MAP

TOWN OF WAWARSING	ULSTER CO., NY
SCALE 1" = 4000'	DATE JANUARY 1981

C.T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB CAPE POND DAM
SHEET NO. ____ OF ____
CALCULATED BY ELV DATE 4/14/81
CHECKED BY GMB DATE 8/20/81
SCALE 58.01.00008

DRAINAGE AREAS

	AREA (acres)	AREA (square miles)
WATERSHED DIRECT TO ULSTER HEIGHTS LAKE (SUBAREA 1)	5,703.4	8.912
ULSTER HEIGHTS LAKE SURFACE (SUBAREA 2) @ OUTLET BOX EL = 1013 (SEE C-9)	48.4	.076
WATERSHED ABOVE CAPE POND + BELOW ULSTER HEIGHTS LAKE (SUBAREA 3)	6,338.9	9.904
CAPE POND SURFACE (SUBAREA 4) @ SPILLWAY CREST EL = 1000 (SEE C-12)	229.6	.359
TOTAL	12,320.3	19.251

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB CAPE POND DAM
SHEET NO. ____ OF ____
CALCULATED BY CLV DATE 4/14/81
CHECKED BY GMB DATE 8/20/81
SCALE 58.01.00008

DRAINAGE AREA DATA FOR HEC-1 DB MODEL

SUBAREA 1: AREA TRIBUTARY TO ULSTER HEIGHTS LAKE
AREA = 8.912 SQUARE MILES

LOSS RATES: 1.0" - INITIALLY
0.1"/HOUR - CONSTANT LOSS RATE

UNIT HYDROGRAPH PARAMETERS: USE SNYDER METHOD

A = DRAINAGE AREA = 8.912 SQUARE MILES
L = LENGTH OF MAIN WATERCOURSE TO UPSTREAM LIMIT OF DRAINAGE AREA = 4.01 MILES
L_{CA} = LENGTH ALONG MAIN WATERCOURSE TO POINT OPPOSITE THE CENTROID OF THE DRAINAGE AREA = .57 MILES
C_t = SNYDER'S BASIN COEFFICIENT = 1.7 (FROM REF. 20)
C_p = SNYDER'S PEAKING COEFFICIENT = .470 (FROM REF. 20)
t_p = STANDARD LAG IN HOURS = $C_t(LL_{CA})^{0.3}$ = 2.18 HOURS

REQUIRED UNIT RAINFALL DURATION = t_r
$t_r = \frac{t_p}{5.5} = \frac{2.18}{5.5}$ = 0.40 hr. ≈ 24 min. max
USE t_r = 10 min < 24 min OK

∴ USE t_p = 2.2 HOURS

SUBAREA 2: ULSTER HEIGHTS LAKE SURFACE, AREA = .076 SQ. MILES = 48.4 ACRES

LOSS RATES: NONE BECAUSE RAINFALL ≈ RUNOFF FOR WATER SURFACE

UNIT HYDROGRAPH PARAMETERS:

FOR U.H. W/ 10 MINUTE DURATION & 1" RAIN

$$\bar{Q} = \frac{A(1")}{t} = \frac{48.4 \text{ acres}(1")}{10 \text{ minutes}} \left(\frac{43{,}560 \text{ sq ft}}{1 \text{ acre}}\right)\left(\frac{1 \text{ ft}}{12 \text{ inches}}\right)\left(\frac{1 \text{ minute}}{60 \text{ seconds}}\right)$$

$\bar{Q}$ = 293 cfs (W/O LOSS RATE)

Form CTM-400

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB CAPE POND DAM
SHEET NO ____ OF ____
CALCULATED BY ELV DATE 4/14/81
CHECKED BY [illegible] DATE 8/20/81
SCALE 58.01.00008

DRAINAGE AREA DATA FOR HEC-1 DB MODEL

SUBAREA 3: AREA ABOVE CAPE POND + BELOW ULSTER HEIGHTS LAKE TRIBUTARY TO CAPE POND, AREA = 9.904 SQUARE MILES

LOSS RATES: 1.0" - INITIALLY
0.1"/HOUR - CONSTANT LOSS RATE

UNIT HYDROGRAPH PARAMETERS: USE SNYDER METHOD

A = DRAINAGE AREA = 9.904 SQUARE MILES
L = LENGTH OF MAIN WATERCOURSE TO UPSTREAM LIMIT OF DRAINAGE AREA = 4.85 MILES
L_{CA} = LENGTH ALONG MAIN WATERCOURSE TO POINT OPPOSITE THE CENTROID OF THE DRAINAGE AREA = .83 MILES
C_t = SNYDER'S BASIN COEFFICIENT = 1.7 (FROM REF. 20)
C_p = SNYDER'S PEAKING COEFFICIENT = .470 (FROM REF. 20)
t_p = STANDARD LAG IN HOURS = $C_t(L L_{CA})^{0.3}$ = 2.58 HOURS

∴ USE t_p = 2.6 HOURS

REQUIRED UNIT RAINFALL DURATION = t_r
$t_r = \frac{t_p}{5.5} = \frac{2.58}{5.5} = 0.47$ hr. ≈ 28 min. max
USE t_r = 10 min < 28 min OK

SUBAREA 2: CAPE POND SURFACE, AREA = .359 SQ. MILES = 229.6 ACRES

LOSS RATES: NONE BECAUSE RAINFALL ≈ RUNOFF FOR WATER SURFACE

UNIT HYDROGRAPH PARAMETERS:

FOR U.H. W/ 10 MINUTE DURATION + 1" RAIN

$$\bar{Q} = \frac{A(1")}{t} = \frac{229.6 \text{ acres}(1")}{10 \text{ minutes}} \left(\frac{43{,}560 \text{ SQ FT}}{1 \text{ acre}}\right)\left(\frac{1 \text{ FT}}{12 \text{ INCHES}}\right)\left(\frac{1 \text{ minute}}{60 \text{ seconds}}\right)$$

$\bar{Q}$ = 1,389 cfs (W/O LOSS RATE)

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB CAPE POND DAM
SHEET NO ____ OF ____
CALCULATED BY ELV DATE 4/14/81
CHECKED BY GPB DATE 8/20/81
SCALE 58.01.00008

ELEVATION - AREA - STORAGE COMPUTATIONS

ULSTER HEIGHTS LAKE VOLUME: FOR STORAGE ABOVE SPILLWAY CREST VOLUME COMPUTED BY METHOD OF CONIC SECTIONS

$$\Delta V_{12} = h/3 (A_1 + A_2 + \sqrt{A_1 A_2})$$

	ELEVATION (NGVD - ft.) (1)	AREA (acres) (2)	INPUT VOLUME (acre-feet)
OUTLET PIPE INVERT	1001	—	0
SERVICE SPILLWAY (OUTLET BOX) CREST	1013	48.4	240 (1)
AUXILIARY SPILLWAY CREST	1013.5	51.0 (INTERPOLATED)	272.8 (INTERPOLATED)
TOP OF DAM	1020	84.5	699
	1040	250.5	3902

(1) INFORMATION FROM ENGINEERING REPORTS AND PLANS FOR DAM CONSTRUCTION IN 1969 AS FOUND IN FILES OF NYSDEC.

(2) FROM USGS TOPOGRAPHIC MAPPING.

FORM CTM - 5

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB CAPE POND DAM
SHEET NO. ____ OF ____
CALCULATED BY ELV DATE 4/14/81
CHECKED BY [illegible] DATE 8/20/81
SCALE 58.01.00008

DISCHARGE COMPUTATIONS - ULSTER HEIGHTS LAKE DAM

DAM APPURTENANCE	ELEVATION (NGVD)	SIZE
OUTLET PIPE	INVERT EL = 1001	3' DIAMETER
OUTLET BOX (SERVICE SPILLWAY)	CREST EL = 1013	8'x10' DROP INLET
EAST CHANNEL SPILLWAY (LEFT)	CREST EL = 1013.5	60' BOTTOM WIDTH 86' TOP WIDTH
WEST CHANNEL SPILLWAY (RIGHT)	CREST EL = 1013.5	40' BOTTOM WIDTH 66' TOP WIDTH
DAM	CREST EL = 1020	175' CREST LENGTH (W/O SPILLWAYS)

	ELEVATION NGVD	H_{OB} (ft.)	H_{ES} (ft.)	H_{WS} (ft.)	H_D (ft.)	Q_{PIPE} (cfs)	Q_{OB}* (cfs)	Q_{ES}** (cfs)	Q_{WS}** (cfs)	INPUT $Q_{ALL\ SPILLWAYS}$ (cfs)	Q_{DAM}*** (cfs)	Q_{TOTAL} (cfs)
SERVICE SPILLWAY CREST	1013	0	—	—	—	0	0	0	0	0	0	0
AUXILIARY SPILLWAY CREST	1013.5	.5	0	0	—	ASSUMED CLOSED	160	0	0	160	0	160
	1014	1	.5	.5	—		160	67	45	272	0	272
	1016	3	2.5	2.5	—		160	793	549	1502	0	1,502
	1018	5	4.5	4.5	—		160	2,033	1,444	3,637	0	3,637
	1020	7	6.5	6.5	0		160	3,734	2,711	6,605	0	6,605
	1022	9	8.5	8.5	2		160	5,814	4,284	10,258	1,528	11,786
	1024	11	10.5	10.5	4	0	160	8,403	6,092	14,655	4,322	18,977

Form LM-403

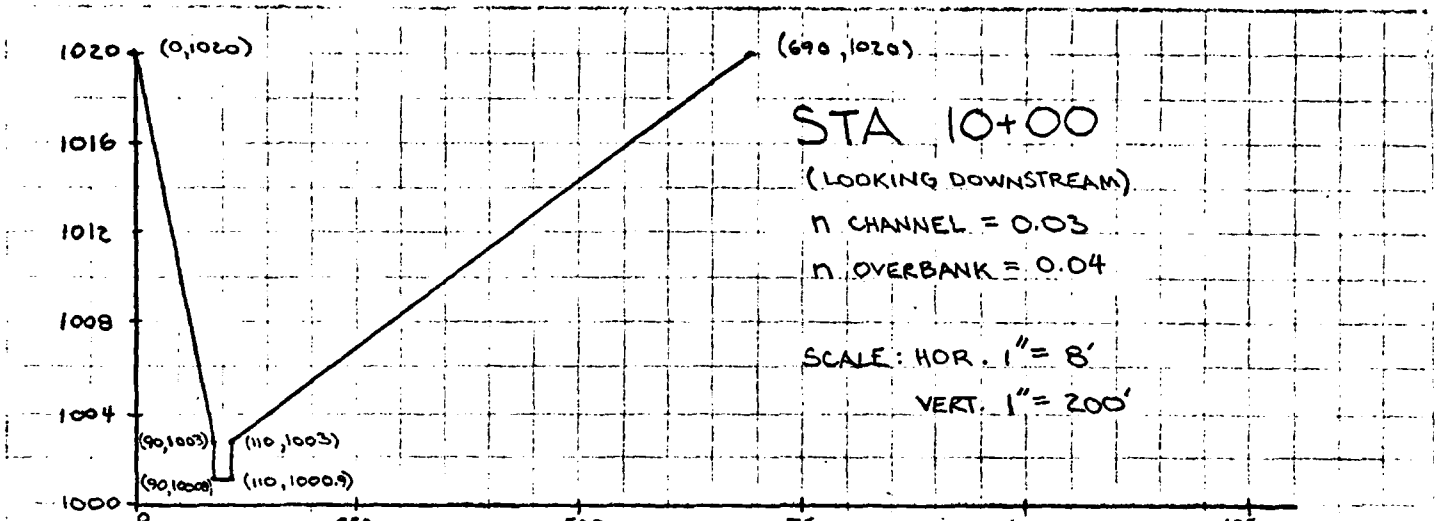
* FROM ENGINEERING DATA FOUND IN NYSDEC FILES. Q ASSUMED CONSTANT FOR SIMPLICITY.

** USED FORMULA FOR CRITICAL FLOW OVER A BROAD CRESTED WEIR: $Q = 3.087\,LH^{1.5}$ (REF. 9). USED AVG. L AS H CHANGED SO THAT AREA WOULD BE THE SAME.

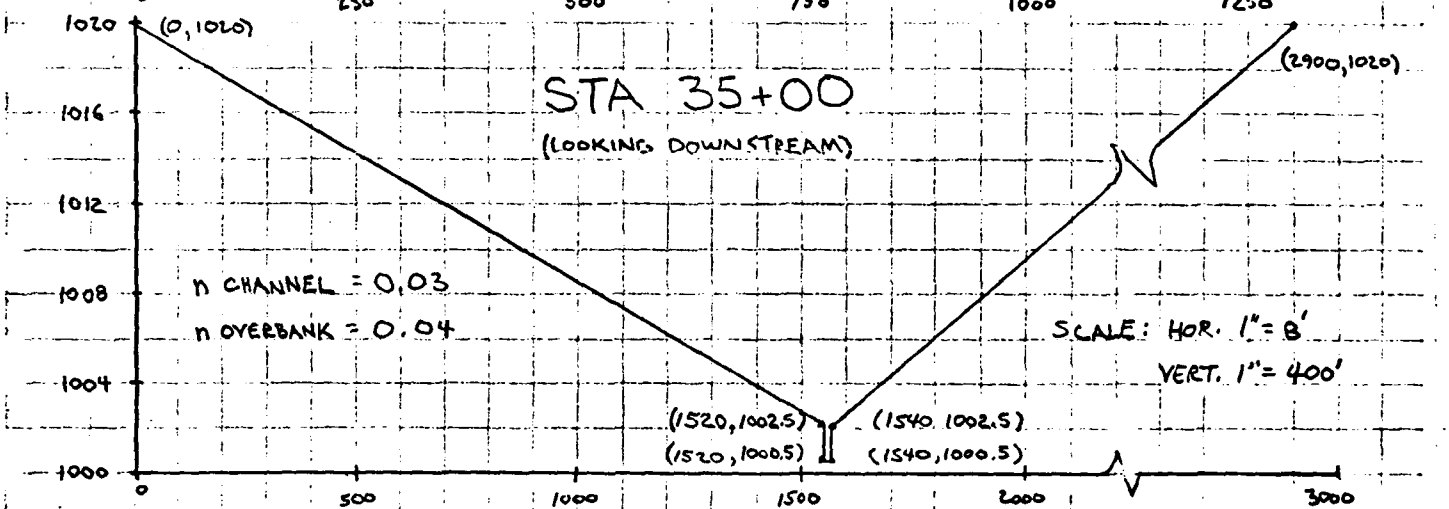
*** CALCULATED BY HEC-1 DB PROGRAM WHERE $Q = 3.087\,LH^{1.5}$ (FORMULA FOR CRITICAL FLOW OVER BROAD-CRESTED WEIR, REF. 9)

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

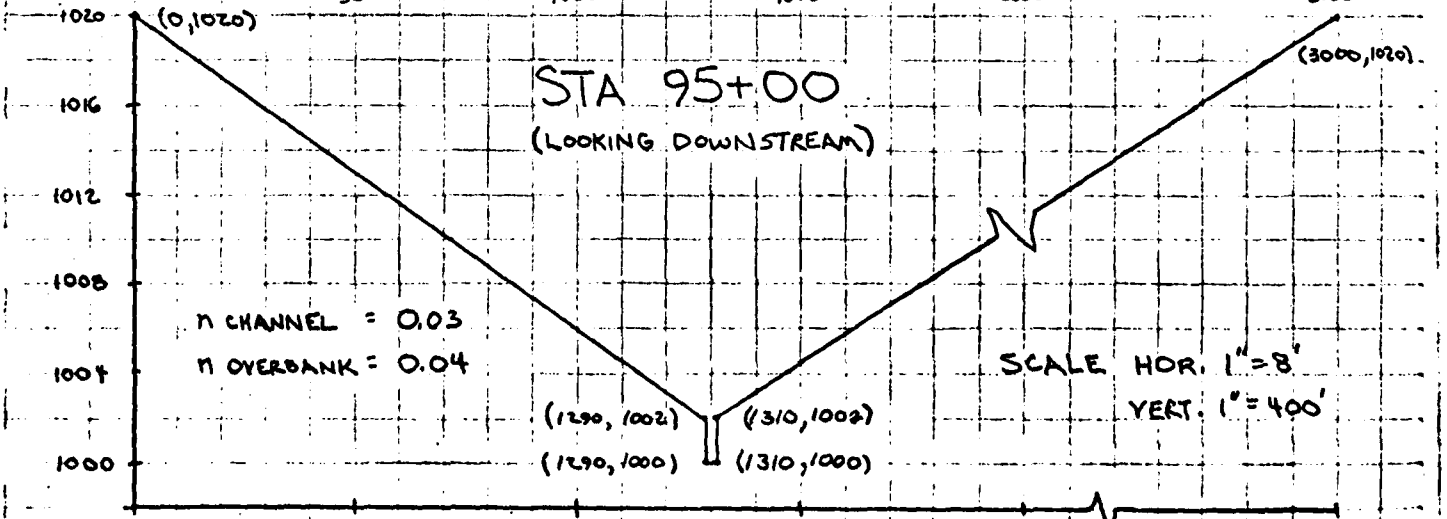
JOB CAPE POND DAM
SHEET NO. ____ OF ____
CALCULATED BY CLV DATE 4/14/81
CHECKED BY TMB DATE 8/20/81
SCALE 58.01.00008



STA 10+00
(LOOKING DOWNSTREAM)
n CHANNEL = 0.03
n OVERBANK = 0.04
SCALE: HOR. 1" = 8'
VERT. 1" = 200'



STA 35+00
(LOOKING DOWNSTREAM)
n CHANNEL = 0.03
n OVERBANK = 0.04
SCALE: HOR. 1" = 8'
VERT. 1" = 400'



STA 95+00
(LOOKING DOWNSTREAM)
n CHANNEL = 0.03
n OVERBANK = 0.04
SCALE HOR. 1" = 8'
VERT. 1" = 400'

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB CAPE POND DAM
SHEET NO ____ OF ____
CALCULATED BY ELV DATE 4/14/81
CHECKED BY GPA DATE 8/20/81
SCALE 58.01.00008

ELEVATION - AREA - STORAGE COMPUTATIONS

CAPE POND VOLUME: FOR STORAGE ABOVE SPILLWAY CREST VOLUME COMPUTED BY METHOD OF CONIC SECTIONS $\Delta V_{12} = h/3 (A_1 + A_2 + \sqrt{A_1 A_2})$

	ELEVATION (NGVD - ft.) (1)	AREA (acres) (3)	INPUT VOLUME (acre-feet)
OUTLET PIPE 1 INVERT	986.8	—	0
OUTLET PIPE 2 INVERT	991.4	—	—
SPILLWAY CREST	1000	229.6	1,377 (2) (60,000,000 C.F.)
TOP OF DAM	1005.25	448 (EST.)	3,605 (CALC. BY COMPUTER)
	1010	646.4	5,581

(1) CONSTRUCTION DRAWING ELEVATION BASE IS APPROXIMATELY 900' LOWER THAN NGVD ELEVATION. (SEE APPENDIX G-1)

(2) IMPOUNDING CAPACITY AT SPILLWAY CREST FROM RECONSTRUCTION APPLICATION DATED 9/22/14. (SEE APPENDIX F3-7)

(3) FROM USGS TOPOGRAPHIC MAPPING.

NOTE: DIFFERENCE BETWEEN OUTLET PIPE INVERTS, SPILLWAY CREST, & TOP OF DAM BASED ON FIELD MEASUREMENTS.

Form CTM-403

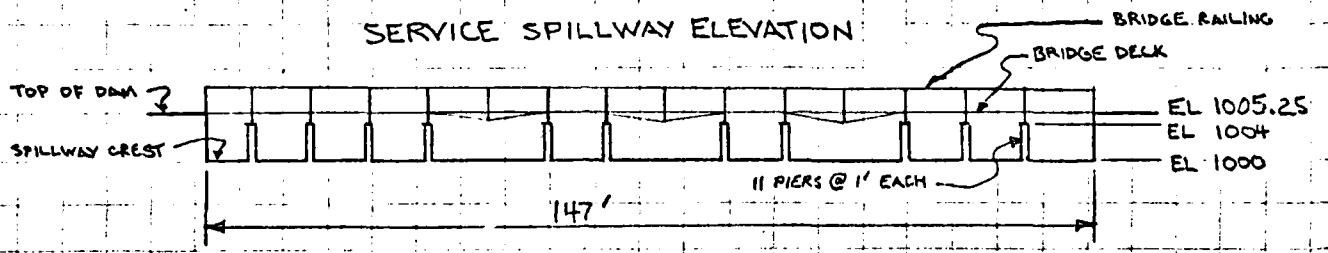
C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB CAPE POND DAM
SHEET NO ____ OF ____
CALCULATED BY ELV DATE 4/14/81
CHECKED BY GPA DATE 8/20/81
SCALE 58.01.00008

DISCHARGE COMPUTATIONS - CAPE POND DAM

SERVICE SPILLWAY CAPACITY - ASSUMED TO ACT AS BROAD-CRESTED WEIR w/ PIER AND ABUTMENT EFFECTS.

SERVICE SPILLWAY ELEVATION



$Q = 3.087 L H^{1.5}$ (FORMULA FOR FLOW OVER BROAD-CRESTED WEIR, REFERENCE 9)

WHERE: $L = L' - 2(NK_p + K_a)H$ (FROM REFERENCE 8, PAGE 37?)

L = EFFECTIVE LENGTH OF CREST
L' = NET LENGTH OF CREST — $L' = 147' - 11(1') = 136'$
N = NUMBER OF PIERS — $N = 11$
K_p = PIER CONTRACTION COEFFICIENT — $K_p = 0.02$ (FOR SQUARE-NOSED PIER)
K_a = ABUTMENT CONTRACTION COEFFICIENT — $K_a = 0.20$ (FOR SQUARE ABUTMENT W/ HEADWALL @ 90° TO FLOW)
H = TOTAL HEAD ON CREST

$L = L' - 0.84H$

ELEVATION (NGVD)	H (Feet)	L' (feet)	L (Feet)	Q SPILLWAY (cfs)
1000	0	136	136	0
1001	1	136	135.16	417
1002	2	136	134.32	1,173
1003	3	136	133.48	2,141
1004	4	136	132.64	3,276
1005.25	5.25	136	131.59	4,887 (SAY 4,890)
1006	6	136	130.96	5,942
1008	8	136	129.28	9,030
1010	10	136	127.60	12,456
1012	12	136	125.92	16,159

F.... CTI.. .J5

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB CAPE POND DAM
SHEET NO. ____ OF ____
CALCULATED BY ELV DATE 4/14/81
CHECKED BY [illegible] DATE 8/20/81
SCALE 58.01.00008

DISCHARGE COMPUTATIONS - CAPE POND DAM

OUTLET PIPE CAPACITY

DAM HAS TWO 48" RIVETED STEEL OUTLET PIPES W/ UPSTREAM CONTROL GATES AT DAM. DAM HAS PART-TIME OPERATOR WHO LIVES AT DAM & OPERATES GATES AS NECESSARY.

$Q = CA\sqrt{2gh}$ FORMULA FOR ORIFICE FLOW THROUGH PIPE (INLET CONTROL) W/ FREE DISCHARGE, SEE REFERENCE 9.

GATE 1: LOCATED NEAR LEFT ABUTMENT, LOOKING D/S
PIPE SLOPE FLAT, INVERT @ EL 986.8, ℄ @ EL 988.8

GATE 2: LOCATED NEAR SPILLWAY
PIPE SLOPE FLAT, INVERT @ EL 991.4, ℄ @ EL 993.4

C = 0.6, $A = \pi r^2 = \pi(2')^2 = 12.57$ SQ. FT. (BOTH OUTLETS)

ELEVATION (NGVD)	h_1* (feet)	h_2* (feet)	Q_{DP1} (cfs)	Q_{DP2} (cfs)	Q_{TOTAL} (cfs)
1000	11.2	6.6	0	0	0**
1001	12.2	7.6	211	167	378
1002	13.2	8.6	220	177	397
1003	14.2	9.6	228	187	415
1004	15.2	10.6	236	197	433
1005.25	16.45	11.85	245 (SAY 240)	208 (SAY 210)	453 (SAY 450)
1006	17.2	12.6	251	215	466
1008	19.2	14.6	265	231	496
1010	21.2	16.6	279	247	526
1012	23.2	18.6	291	261	552

** ASSUMED THAT GATES NOT OPEN AT START OF ROUTING

* h = HEIGHT FROM WATER SURFACE TO ℄ OUTLETS AT GATES

C. T. MALE ASSOCIATES, P.C.
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976
PROFESSIONAL ENGINEERS LAND SURVEYORS LAND PLANNING CONSULTANTS
COMPUTER SERVICES LANDSCAPE ARCHITECTURE LABORATORY SERVICES

JOB CAPE POND DAM
SHEET NO. ____ OF ____
CALCULATED BY CLV DATE 4/14/81
CHECKED BY [illegible] DATE 8/20/81
SCALE 5801.00008

DISCHARGE COMPUTATIONS - CAPE POND DAM

DAM APPURTENANCE	ELEVATION (NGVD)	SIZE
SERVICE SPILLWAY	CREST EL = 1000	147' CREST LENGTH (INCLUDES 11 PIERS @ 1' EACH)
DAM	CREST EL = 1005.25	465' CREST LENGTH (EXCLUDES SPILLWAY)
OUTLET PIPE 1	INVERT EL = 986.8	4' DIA STEEL PIPE
OUTLET PIPE 2	INVERT EL = 991.4	4' DIA STEEL PIPE

FOR FLOW OVER DAM: $Q = \underbrace{3.087}_{\text{INPUT}} L H^{1.5}$ (FORMULA FOR CRITICAL FLOW OVER BROAD-CRESTED WEIR, REFERENCE?)
INPUT

ELEVATION (NGVD)	H_D (feet)	Q_{OP1} (cfs)	Q_{OP2} (cfs)	$Q_{SPILLWAY}$ (cfs)	$Q_{APPURTENANCES}$ (cfs)	Q_{DAM} (cfs)	Q_{TOTAL} (cfs)
1000	0	0	0	0	0	0	0
1001	0	211	167	417	795	0	795
1002	0	220	177	1,173	1,570	0	1,570
1003	0	228	187	2,141	2,556	0	2,556
1004	0	236	197	3,276	3,709	0	3,709
1005.25	0	245	208	4,887	5,340	0	5,340
1006	.75	251	215	5,942	6,408	932	7,340
1008	2.75	265	231	9,030	9,526	6,546	16,072
1010	4.75	279	247	12,456	12,982	14,860	27,842
1012	6.75	291	261	16,156	16,708	25,174	41,882

Form CTM-405

```
A NYD DAM INSPECTION: DACW51-81-C-0014
A NYC0269, CAPE POND DAM, 58.01.00008/80.00848
A OVERTOPPING ANALYSIS  CPD1
B   289       0      10                                                    4
B1    5
J     1       2       1
J1   1.C     0.5
K     0    SA-1                                          1
K1 SUBAREA 1 RUNOFF COMPUTATION
M     1       1   8.912          19.251                                   1
P                21     103     116     126     134
T                                                    1.0     .10
M   2.2     .47
X    -2       1
K     0    SA-2                                          1
K1 SUBAREA 2 RUNOFF COMPUTATION
M     1      -1    .076          19.251                                   1
P                21     103     116     126     134
T                                                      0       0
U     1
U1  293
X    -2       1
K     2    SA-2C                                         1
K1 COMBINING HYDROGRAPHS 1 & 2
K     1    RES1                                          1
K1 ROUTING FLOWS THROUGH RESERVOIR 1 (ULSTER HEIGHTS LAKE)
Y                              1       1
Y1    1                                              -1013      -1
Y4 1013  1013.5    1014    1016    1018    1020    1022    1024
Y5    C     180     272    1502    3637    6605   10258   14655
S5    C     240     699    3902
SE 1001    1013    1020    1040
S* 1012
SD 102C   3.087     1.5     175
K     1   10+00                                  5       1
K1 CHANNEL ROUTING STA 10+00
Y                              1       1
Y1    1
Y6  .C4     .03     .04  1000.9    1021    1000   .0001
Y7    C    1021       0    1020      90    1003      90  1000.9     11C  1000.9
Y7  11C    1003     650    1020     690    1021
K     1   35+00                                  5       1
K1 CHANNEL ROUTING STA 35+00
Y                              1       1
Y1    1
Y6  .C4     .03     .04  1000.5    1021    2500   .0002
Y7    C    1021       0    1020    1520  1002.5    1520  1000.5    1540  1000.5
Y7 154C  1002.5    2900    1020    2900    1021
K     1   95+00                                  5       1
K1 CHANNEL ROUTING STA 95+00
Y                              1       1
Y1    1
Y6  .C4     .03     .04    1000    1021    6000   .0001
Y7    C    1021       0    1020    1290    1002    1290    1000    1310    1000
Y7 131C    1002    3000    1020    3000    1021
K     C    SA-3                                          1
K1 SUBAREA 3 RUNOFF COMPUTATION
M     1       1   9.904          19.251                                   1
P                21     103     116     126     134
T                                                    1.0     .10
```

```
W    2.6     .47
X     -2          1
K      0   SA-4                                          1
K1 SUBAREA 4 RUNOFF COMPUTATION
R      1     -1   .359          19.251                                1
P                  21    103    116    126    134
T                                                  0       0
U      1
U1  1389
X     -2          1
K      3   SA-4C                                         1
K1 COMBINING HYDROGRAPHS  2C, 3, & 4
K      1   RES2                2                         1
K1 ROUTING FLOWS THROUGH RESERVOIR 2 (CAPE POND)
Y                              1      1
Y1     1                                          -1000      -1
Y4  10CC    1001    1002    1003    1004 1005.25    1006    1008    1010    1012
Y5      C     795    1570    2526    3709    5340    6408    9526   12982   16708
$S      0    1377    5581
$E  986.8    1000    1010
$*  10CC
$01005.3*   3.087     1.5     465
K      99
A
A
A
A
A
```

* INPUT AS 1005.3 INSTEAD OF 1005.25 BECAUSE OF LENGTH OF FIELD RESTRICTION.

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

 RUN  DATE: 8/11/81
      TIME: 3:10 PM


                    NYD DAM INSPECTION: DACW51-81-C-0014
                    NY00265, CAPE POND DAM, 58.01.00008/80.00848
                    OVERTOPPING ANALYSIS  CPD1

                                    JOB SPECIFICATION
                    NO     NHR    NMIN    IDAY     IHR    IMIN   METRC   IPLT   IPRT  NSTAN
                    288      0      10       0       0       0       0      0      4      0
                                          JOPER     NRT   LROPT   TRACE
                                              5       0       0       0

                                  MULTI-PLAN ANALYSES TO BE PERFORMED
                                      NPLAN= 1 NRTIO= 2 LRTIO= 1
                          RTIOS=   1.00   0.50

                ********** ********** ********** ********** **********

                                  SUB-AREA RUNOFF COMPUTATION

                          SUBAREA 1 RUNOFF COMPUTATION
                                    ISTAQ   ICOMP   IECON   ITAPE   JPLT   JPRT  INAME  ISTAGE  IAUTO
                                     SA-1       0       0       0      0      0      1       0      0

                                          HYDROGRAPH DATA
                          IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO  ISNOW  ISAME  LOCAL
                              1       1    8.91    0.00   19.25    0.00   0.000      0      1      0

                                          PRECIP DATA
                                    SPFE     PMS      R6     R12     R24     R48     R72     R96
                                    0.00   21.00  103.00  116.00  126.00  134.00    0.00    0.00
          TRSPC COMPUTED BY THE PROGRAM IS 0.822

                                          LOSS DATA
                    LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
                        0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.00

                                      UNIT HYDROGRAPH DATA
                                  TP= 2.20   CP=0.47   NTA=  0

                                      RECESSION DATA
                                STRTQ=  -2.00   QRCSN=   0.00   RTIOR= 1.00

          UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG=  2.22 HOURS, CP= 0.47  VOL= 0.99
              23.     89.    193.    295.    421.    558.    702.    846.    974.   1080.
            1164.   1225.   1258.   1254.   1209.   1149.   1092.   1038.    987.    938.
             892.    847.    805.    766.    728.    692.    657.    625.    594.    564.
             536.    510.    485.    461.    438.    416.    396.    376.    357.    340.
             323.    307.    292.    277.    263.    250.    238.    226.    215.    204.
             194.    185.    175.    167.    159.    151.    143.    136.    129.    123.
             117.    111.    106.    100.     95.     91.     85.     82.     78.     74.
              70.     67.     64.     60.     57.     55.     52.     49.     47.     45.
              42.     40.     38.     36.     35.     33.     31.     30.     28.     27.
              25.     24.     23.     22.     21.     20.     19.     18.     17.     16.
```

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	23.13	19.45	3.68	603592.
										(587.)(494.)(94.)(17091.80)			

SUB-AREA RUNOFF COMPUTATION

SUBAREA 2 RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
SA-2	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	0.08	0.00	19.25	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.00	103.00	116.00	126.00	134.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.922

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00

RECESSION DATA

STRTQ= -2.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	23.13	23.13	0.00	6846.
										(587.)(587.)(0.)(193.86)			

COMBINE HYDROGRAPHS

COMBINING HYDROGRAPHS 1 & 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
SA-2C	2	0	0	0	0	1	0	0

HYDROGRAPH ROUTING

ROUTING FLOWS THROUGH RESERVOIR 1 (ULSTER HEIGHTS LAKE)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
RES1	1	0	0	0	0	1	0	0

ROUTING DATA

GLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1013.	-1

STAGE	1012.00	1013.00	1014.00	1016.00	1019.00	1020.00	1022.00	1024.00

```
 FLOW          0.00      160.00      272.00     1502.00     3697.00     6605.00    10258.00    14655.00

 CAPACITY=        0.       240.       699.       3902.

 ELEVATION=    1001.      1013.      1020.       1040.

                          CREL    SPWID     COOW     EXPW    ELEVL     COOL    CAREA     EXPL
                        1013.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0

                                                 DAM DATA
                                                TOPEL     COOD     EXPD   DAMWID
                                               1020.0      3.1      1.5      175.

PEAK OUTFLOW IS    14856. AT TIME  42.50 HOURS

PEAK OUTFLOW IS     7318. AT TIME  42.67 HOURS


NORMAL DEPTH CHANNEL ROUTING
----------------------------

        GN(1)    GN(2)    GN(3)    ELNVT    ELMAX    RLNTH      SEL
       0.0400   0.0300   0.0400   1000.9   1021.0   1000.  0.00010

      CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
          0.00 1021.00     0.00 1020.00    90.00 1003.00    90.00 1000.90   110.00 1000.90
        110.00 1003.00   690.00 1020.00   690.00 1021.00


NORMAL DEPTH CHANNEL ROUTING
----------------------------

        GN(1)    GN(2)    GN(3)    ELNVT    ELMAX    RLNTH      SEL
       0.0400   0.0300   0.0400   1000.5   1021.0   2500.  0.00020

      CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
          0.00 1021.00     0.00 1020.00  1520.00 1002.50  1520.00 1000.50  1540.00 1000.50
       1540.00 1002.50  2900.00 1020.00  2900.00 1021.00


NORMAL DEPTH CHANNEL ROUTING
----------------------------

        GN(1)    GN(2)    GN(3)    ELNVT    ELMAX    RLNTH      SEL
       0.0400   0.0300   0.0400   1000.0   1021.0   6000.  0.00010

      CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
          0.00 1021.00     0.00 1020.00  1290.00 1002.00  1290.00 1000.00  1310.00 1000.00
       1310.00 1002.00  3000.00 1020.00  3000.00 1021.00


 **********       **********       **********       **********       **********

                        SUB-AREA RUNOFF COMPUTATION

              SUBAREA 3 RUNOFF COMPUTATION
                        ISTAQ   ICOMP   IECON   ITAPE   JPLT   JPRT  INAME  ISTAGE  IAUTO
                         SA-3       0       0       0      0      0      1       0      0
```

```
                                              HYDROGRAPH DATA
            IHYDG    IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
               1        1     9.90     0.00    19.25     0.00    0.000        0        1        0

                                                PRECIP DATA
                           SPFE      PMS       R6      R12      R24      R48      R72      R96
                           0.00    21.00   103.00   116.00   126.00   134.00     0.00     0.00
    TRSPC COMPUTED BY THE PROGRAM IS 0.822

                                                 LOSS DATA
                 LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
                     0    0.00    0.00    1.00    0.00    0.00    1.00    1.00    0.10    0.00    0.00

                                            UNIT HYDROGRAPH DATA
                                         TP=  2.60      CP=0.47      NTA=  0

                                               RECESSION DATA
                                STRTQ=    -2.00     QRCSN=      0.00     RTIOR= 1.00

                 UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG=    2.61 HOURS, CP= 0.47   VOL= 0.98
                    17.       66.      136.      220.      314.      417.      527.      642.      759.      868.
                   963.     1043.     1107.     1156.     1187.     1196.     1174.     1128.     1080.     1034.
                   990.      948.      908.      869.      832.      797.      763.      731.      700.      670.
                   641.      614.      588.      563.      539.      516.      494.      473.      453.      434.
                   415.      398.      381.      365.      349.      334.      320.      306.      293.      281.
                   269.      258.      247.      236.      226.      216.      207.      198.      190.      182.
                   174.      167.      160.      153.      146.      140.      134.      129.      123.      118.
                   113.      108.      103.       99.       95.       91.       87.       83.       80.       76.
                    73.       70.       67.       64.       61.       59.       56.       54.       52.       49.
                    47.       45.       43.       42.       40.       38.       36.       35.       33.       32.

        0                                   END-OF-PERIOD FLOW
      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q        MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q

                                                                       SUM  23.13  19.45   3.68   637403.
                                                                          ( 587.)( 494.)(  94.)(18049.23)


             **********        **********        **********        **********        **********

                                          SUB-AREA RUNOFF COMPUTATION

               SUBAREA 4 RUNOFF COMPUTATION
                                 ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                                  SA=4        0        0        0        0        0        1        0        0

                                              HYDROGRAPH DATA
            IHYDG    IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO    ISNOW    ISAME    LOCAL
               1       -1     0.36     0.00    19.25     0.00    0.000        0        1        0

                                                PRECIP DATA
                           SPFE      PMS       R6      R12      R24      R48      R72      R96
                           0.00    21.00   103.00   116.00   126.00   134.00     0.00     0.00
    TRSPC COMPUTED BY THE PROGRAM IS 0.822

                                                 LOSS DATA
                 LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
                     0    0.00    0.00    1.00    0.00    0.00    1.00    0.00    0.00    0.00    0.00

                                               RECESSION DATA
                                STRTQ=    -2.00     QRCSN=      0.00     RTIOR= 1.00

        0                                   END-OF-PERIOD FLOW
      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q        MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS    COMP Q
```

SUM 23.13 23.13 0.00 32283.
(587.)(587.)(0.)(914.15)

********** ********** ********** ********** **********

COMBINE HYDROGRAPHS

COMBINING HYDROGRAPHS 2C, 3, 6 4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
SA-4C	3	0	0	0	0	1	0	0

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING FLOWS THROUGH RESERVOIR 2 (CAPE POND)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
RES2	1	0	0	2	0	1	0	0

ROUTING DATA

CLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1000.	-1

STAGE	1000.00	1001.00	1002.00	1003.00	1004.00	1005.25	1006.00	1008.00	1010.00
FLOW	0.00	795.00	1570.00	2556.00	3709.00	5340.00	6408.00	9526.00	12982.00
CAPACITY=	0.	1377.	5581.						
ELEVATION=	587.	1000.	1010.						

CREL	SPWID	COOW	EXPW	ELEV	COOL	CAREA	EXPL
1000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1005.3	3.1	1.5	465.

PEAK OUTFLOW IS 25419. AT TIME 44.17 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	RATIO 2 0.50
HYDROGRAPH AT	SA-1	8.91	1	15492.	7746.
		(23.08)		(438.70)(	219.35)(
HYDROGRAPH AT	SA-2	0.08	1	891.	445.
		(0.20)		(25.23)(	12.61)(
2 COMBINED	SA-2C	8.99	1	15588.	7794.
		(23.28)		(441.41)(	220.70)(
ROUTED TO	RES1	8.99	1	14856.	7318.
		(23.28)		(420.68)(	207.22)(
ROUTED TO	10+0C	8.99	1	14840.	7308.
		(23.28)		(420.23)(	206.93)(
ROUTED TO	35+0C	8.99	1	14666.	7222.
		(23.28)		(415.28)(	204.49)(
ROUTED TO	95+00	8.99	1	13267.	6437.
		(23.28)		(375.69)(	182.26)(
HYDROGRAPH AT	SA-3	9.90	1	12691.	7846.
		(25.65)		(444.32)(	222.16)(
HYDROGRAPH AT	SA-4	0.36	1	4223.	2112.
		(0.91)		(119.59)(	59.79)(
3 COMBINED	SA-4C	19.25	1	26947.	12952.
		(49.86)		(763.05)(	366.77)(
ROUTED TO	RES2	19.25	1	25419.	10944.
		(49.86)		(719.79)(	309.89)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1013.00	1013.00	1020.00
STORAGE	240.	240.	699.
OUTFLOW	0.	0.	6605.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1022.89	2.89	1161.	14856.	6.83	42.50	0.00
0.50	1020.33	0.33	752.	7318.	2.33	42.67	0.00

PLAN 1 STATION 10+00

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	14850.	1022.6	42.67
0.50	7308.	1018.0	42.83

PLAN 1 STATION 35+00

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	14666.	1012.8	43.00
0.50	7222.	1010.3	43.17

PLAN 1 STATION 95+00

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	13267.	1013.3	44.17
0.50	6437.	1010.5	44.50

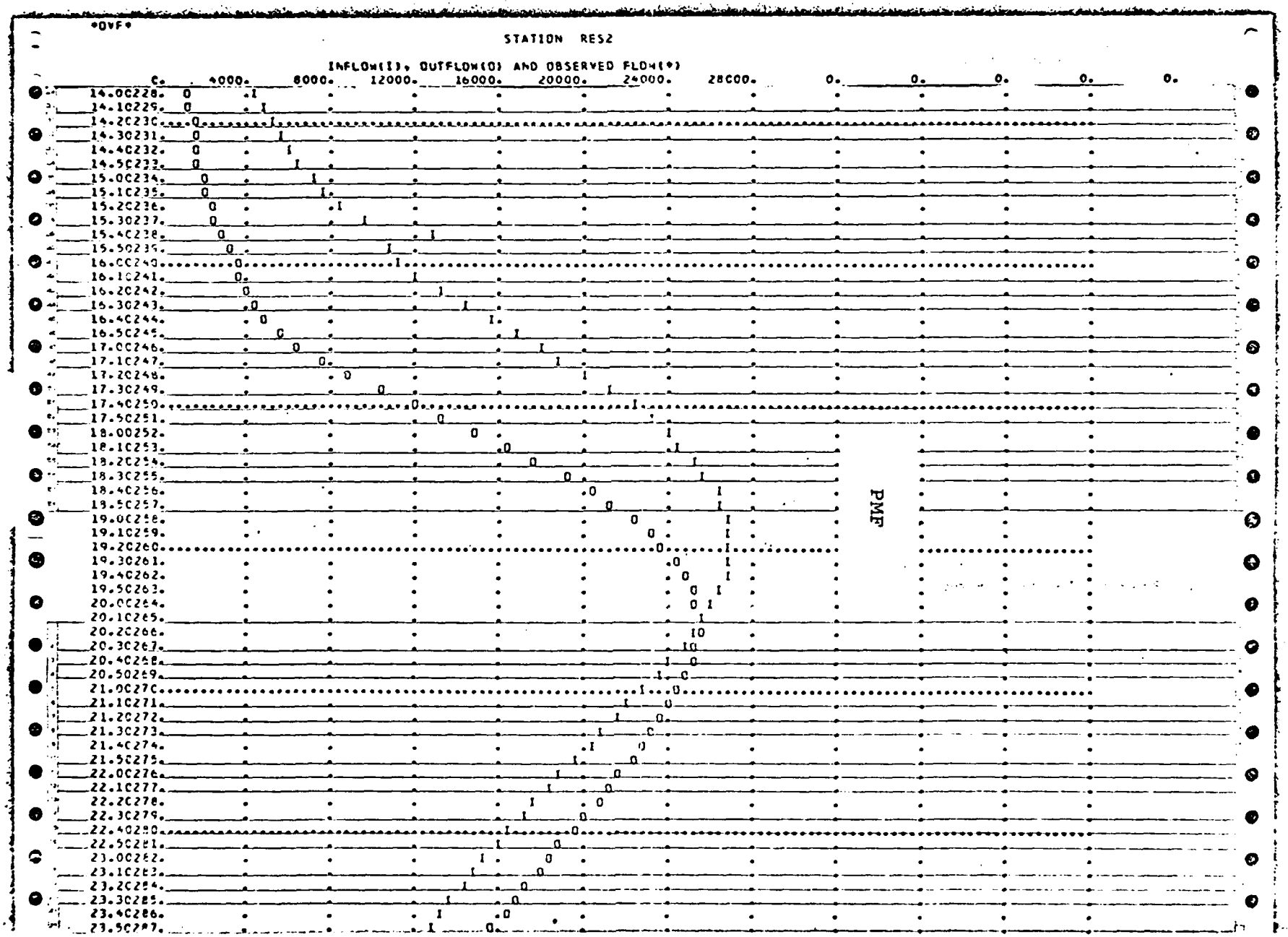
SUMMARY OF DAM SAFETY ANALYSIS

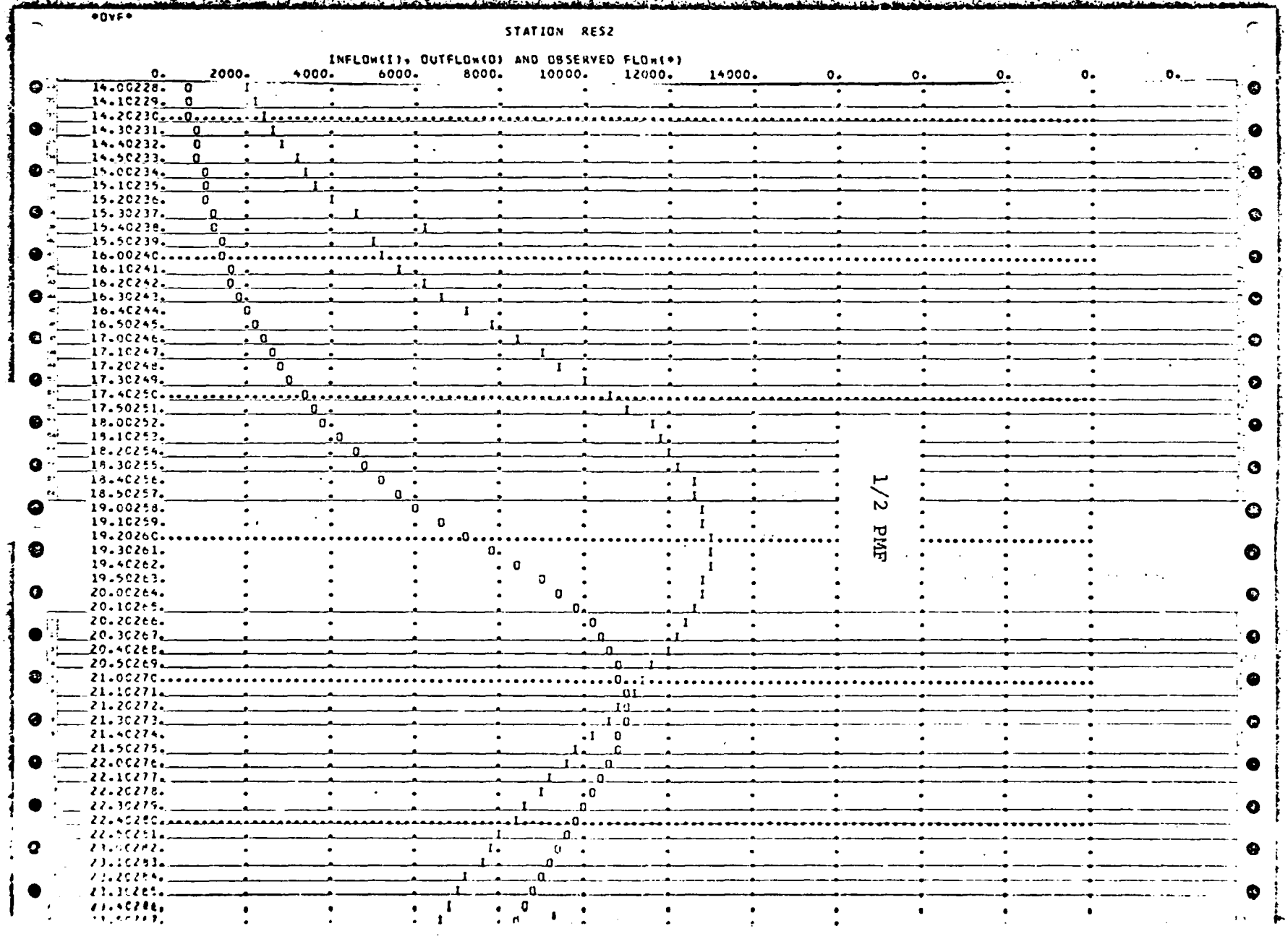
PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM*
ELEVATION	1000.00	1000.00	1005.30 (ACTUALLY 1005.25)
STORAGE	1377.	1377.	3605.
OUTFLOW	0.	0.	5411. (ACTUALLY 5340)

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1009.65	4.35	5435.	25419.	7.33	44.17	0.00
0.50	1006.95	1.65	4306.	10944.	5.33	45.33	0.00

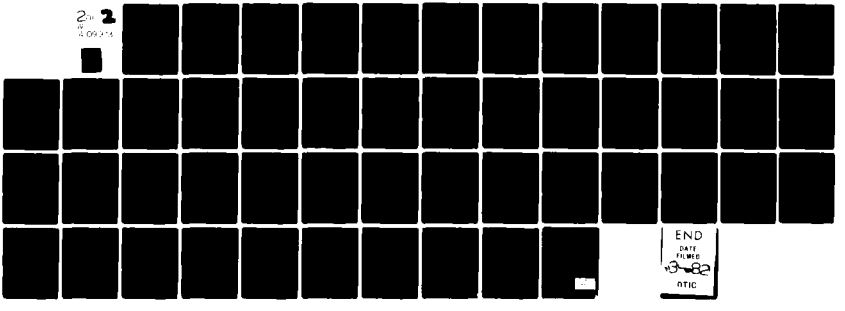
* DUE TO INPUT FIELD LENGTH RESTRICTION, DAM IS STILL OVERTOPPED FOR BOTH PMF + 1/2 PMF.


DVF
STATION RES2
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
C. 4000. 8000. 12000. 16000. 20000. 24000. 28000. 0. 0. 0. 0. 0.
PMF


OVF
STATION RES2
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0. 2000. 4000. 6000. 8000. 10000. 12000. 14000. 0. 0. 0. 0. 0.
1/2 PMF

AD-A109 973 MALE (C T) ASSOCIATES SCHENECTADY NY F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. CAPE POND DAM (INVENTORY NUMBE--ETC(U)
SEP 81 K J MALE DACW51-81-C-0014

UNCLASSIFIED NL



APPENDIX D

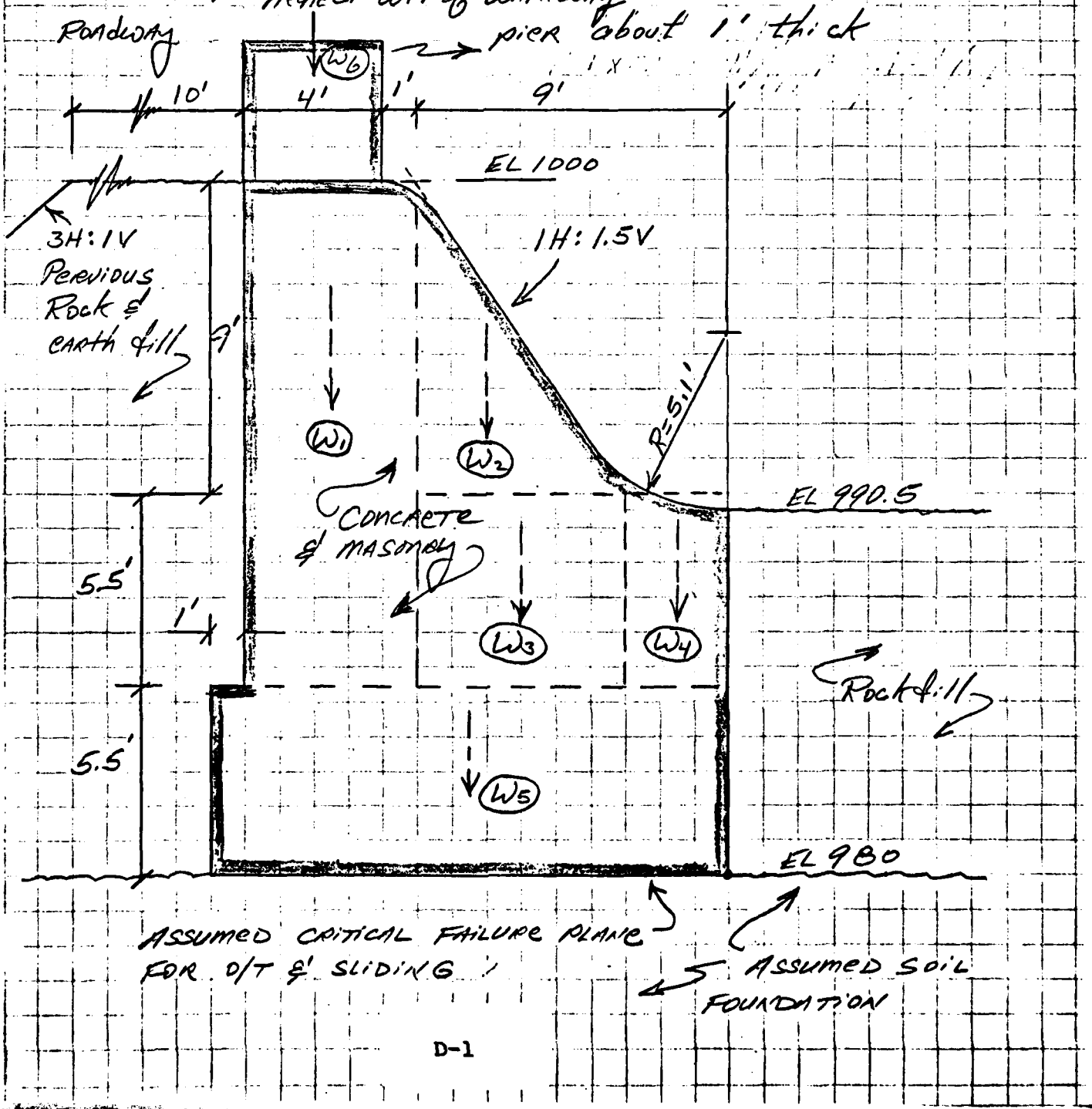
STABILITY ANALYSIS

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO. 1 OF 8
CALCULATED BY GMB DATE 8/20/81
CHECKED BY F.A.C. DATE 8/24/81
SCALE 1/4" = 1'-0"

STABILITY ANALYSIS OF SPILLWAY SECTION

CROSS SECTION FOR ANALYSIS - Typical section based on drawing Appendix G-1. Take highest section thru pier. neglect wt. of walkway pier about 1' thick



FORM TM-35A

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

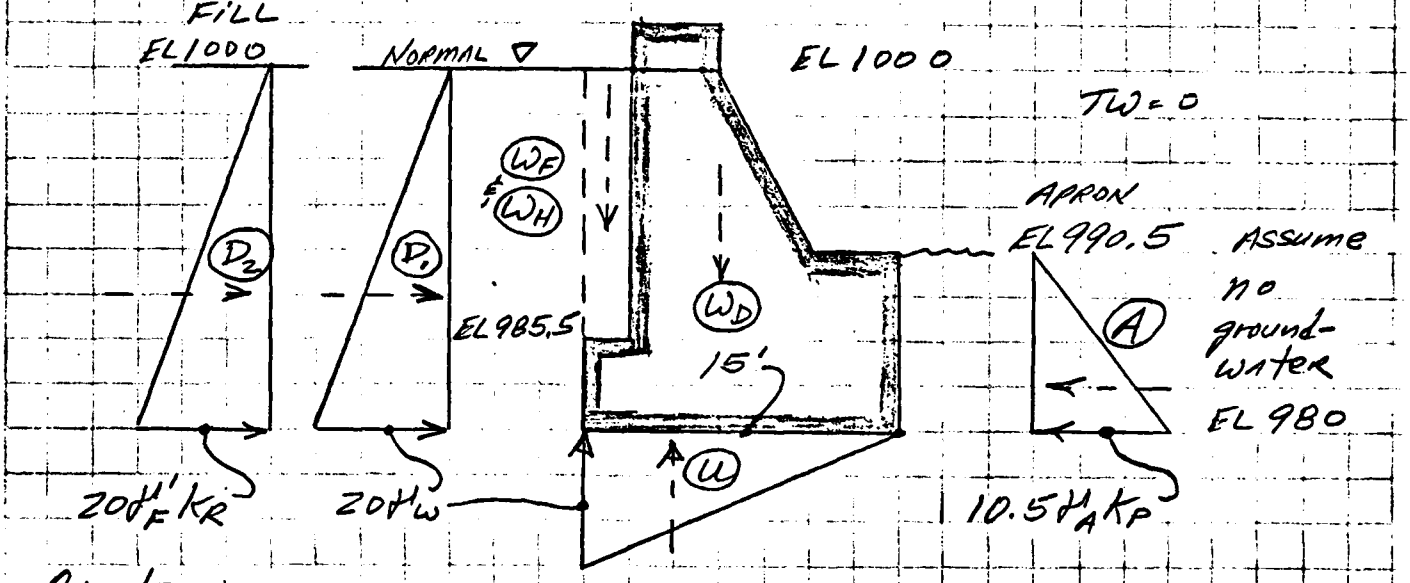
JOB CAPE POND DAM
SHEET NO. 2 OF 8
CALCULATED BY JTB DATE 8/21/81
CHECKED BY F.T.C. DATE 8/24/81
SCALE None

Dead

Load	Volume	× Unit Wt.	= W	× Arm about toe	= M
W_1	5×14.5×1	× 0.150 k/cf	= 10.88	× (5/2 + 9)	= 125.06
W_2	1/2×6×9×1	× 0.150	= 4.05	× [(6×2/3) + 3]	= 28.35
W_3	6×5.5×1	× 0.150	= 4.95	× (6/2 + 3)	= 29.70
W_4	3×5.5×1	× 0.150	= 2.48	× 3/2	= 3.71
W_5	15×5.5×1	× 0.150	= 12.38	× 15/2	= 92.81
W_6	4×4×1	× 0.150	= 2.40	× (4/2 + 10)	= 28.80
			W_D = 37.14 K		ΣM = 308.43

Horiz. moment

CASE 1 - Normal pool at spillway crest, no TW, full HW uplift, rock & earth fill roadway at spillway crest u/s, rockfill apron at HW toe.



Overturning

Resisting Forces	× Moment Arm about toe	= M_R
W_D = dead load = (37.14) K As above		= 308.43
W_H = wt. of normal HW = 1×14.5×0.0624 = (0.90)	× (1/2 + 14)	= 13.12
W_F = submerged wt. of fill, where γ'_F = 130 - 62.4 = 68 #/cf = 0.068 k/cf = 1×14.5×0.068 = (0.99)	× (1/2 + 14)	= 14.30

Fc JTN 5A

C. T. MALE ASSOCIATES, P. C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO. 3 OF 8
CALCULATED BY GPB DATE 8/21/81
CHECKED BY FAC. DATE 8/24/81
SCALE None

CASE I OVERTURNING (cont'd)

A = Apron pressure, where $\gamma_A = 120\#/cf = 0.120 k/cf$
& K_P = coeff. of horiz. passive earth pressure = 4.0

$= 1/2 \times 10.5 \times 0.120 \times 4 \times 10.5 = 26.46 \times 10.5/3 =$ 92.61

$\Sigma M_R =$ 428.46 M_D

Driving Forces

D_1 = Normal HW pressure
$= 1/2 \times 20 \times 0.0624 \times 20 = 12.48 \times 20/3 =$ 83.20

D_2 = submerged fill pressure, where $\gamma_F' = 0.068 k/cf$
& K_R = coeff. of horiz. earth pressure at rest = 0.5
$= 1/2 \times 20 \times 0.068 \times 0.5 \times 20 = 6.8 \times 20/3 =$ 45.33

U = normal HW uplift
$= 1/2 \times 20 \times 0.0624 \times 15 =$ (9.36) $\times 15 \times 2/3 =$ 93.60

$\Sigma M_D =$ 222.13

$FS = \Sigma M_R / \Sigma M_D = \frac{428.46}{222.13} =$ (1.93)

Resultant from toe = $d = \Sigma M_T / \Sigma V = \frac{\Sigma M_R - \Sigma M_D}{W_D + W_H + W_F - U}$

$d = \frac{206.33}{37.14 + 0.90 + 0.99 - 9.36} = \frac{206.33}{29.67} = 6.95' \times \frac{b}{15'} =$ (0.46b)

CASE I SLIDING Assume sliding along concrete/soil contact

Resisting Forces

R_S = Horiz. resisting force = $\Sigma V \tan\phi + C$ (Reference 1)
where C = cohesion along failure plane = 0
ϕ = angle of sliding friction = 32° Assumed
ΣV = vertical effective force
= 29.67 k per o/t above

$R_S = 29.67 \tan 32° =$ 18.54 k

Driving Forces

D_1 = Normal HW pressure = from o/t above = 12.48
D_2 = submerged fill pressure = " " " = 6.80
A = Apron pressure = " " " = (-) 26.46
$FS = R_S/D_3 = 18.54/-7.18 =$ effectively (∞) $D_3 =$ -7.18 k

FC .TM · 5A

C. T. MALE ASSOCIATES, P. C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO. 4 OF 8
CALCULATED BY JPR DATE 8/21/81
CHECKED BY F.A.C. DATE 8/24/81
SCALE None

CASE 2 - Normal Pool plus ice load

N/A, same as Case 1, since ice acts against the upstream side of the roadway fill. This force cannot effectively be transmitted through the fill. Ice will not be present during higher water stages unless flashboards are deliberately added.

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CARE POND DAM
SHEET NO. 5 OF 8
CALCULATED BY GDB DATE 8/21/81
CHECKED BY FMC DATE 8/24/81
SCALE None

ESTIMATE TAILWATER FOR FLOOD CONDITIONS

Based on theoretical velocity of flow at toe of an overflow spillway. This method gives a lower bound on depths which is the most critical case for stability purposes.

½PMF Q = 10,900 cfs total, HW EL 1007.0
PMF Q = 25,400 " " " " 1009.7
Per Appendix C-13, flow over just spillway:
½PMF @ 1007.0, $Q_s \cong$ 7490 cfs
PMF @ 1009.7, Q_s = 11,940 "
Spillway length clear at crest = 136'
" " " " toe = 147'
specific discharge at toe = $q = Q_s/L = Q_s/147'$

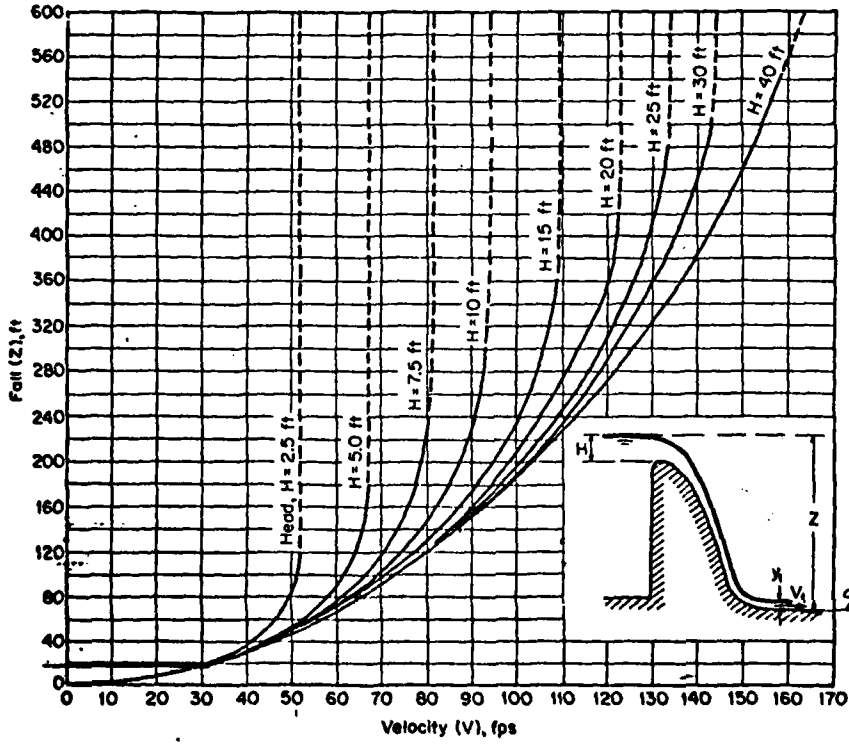


FIG. 14-15. Curves for determination of velocity at the toe of spillways with slopes 1 on 0.6 to 0.8.
By Chow, Ref. 32

0.8H:1V = 1H:1.25V
0.6H:1V = 1H:1.67V
ACTUAL = 1H:1.5V ok

990.5

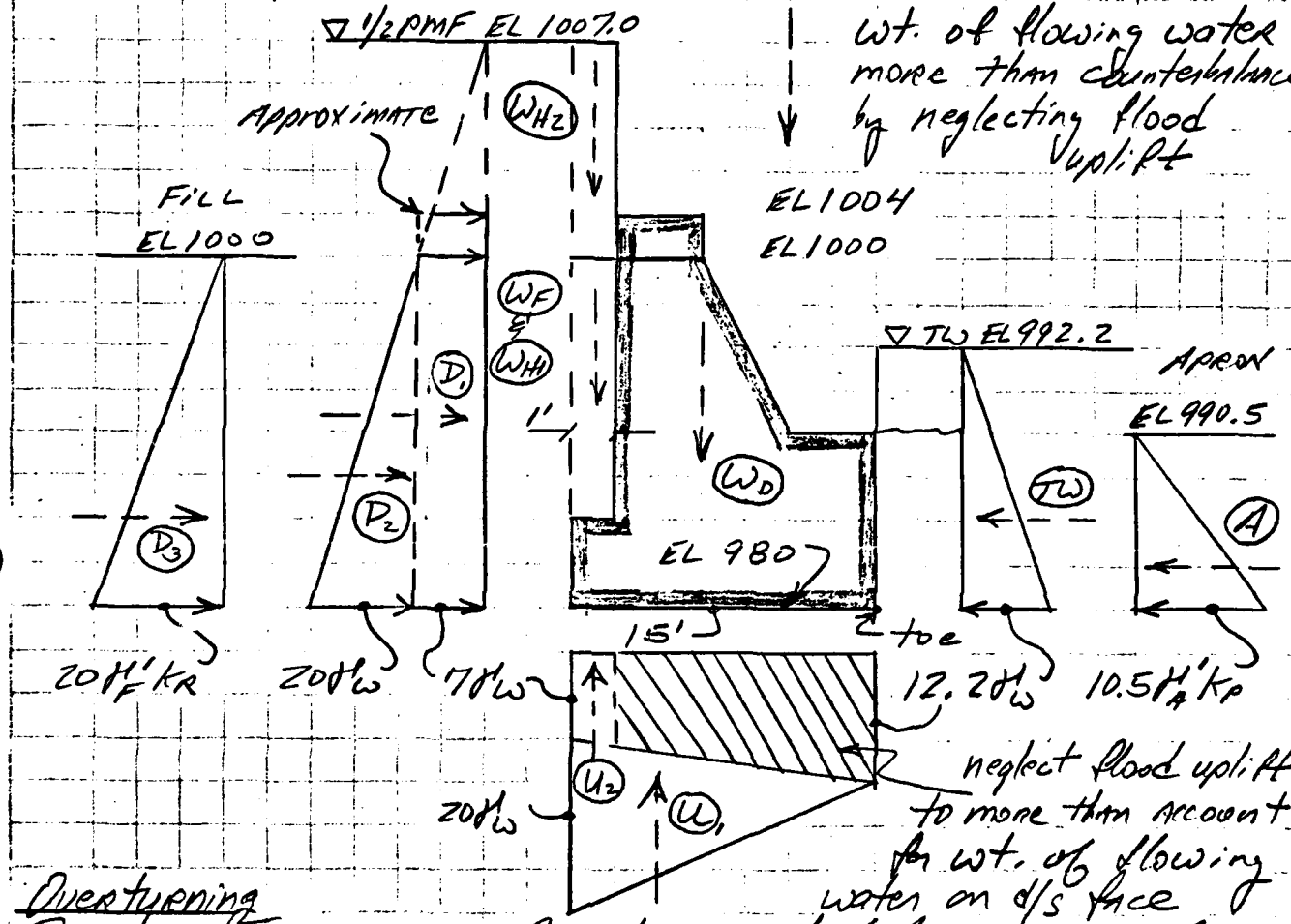
FOR ½ PMF
H = 1007.0 − 1000 = 7.0
Z = " − 990.5 = 16.5
∴ V ≅ 30 fps
$q = 7490/147 = 51.0$ ft²/sec
$d = q/V = \frac{51 \text{ ft}^2/\text{sec}}{30 \text{ ft/sec}}$
d = 1.7'
∴ TW EL = (992.2)

FOR PMF
H = 1009.7 − 1000 = 9.7
Z = " − 990.5 = 19.2
∴ V ≅ 32 fps
$q = \frac{11940}{147} = 81.2$
$d = q/V = \frac{81.2}{32}$
d ≅ 2.5
∴ TW EL = (993.0)

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CADE POND DAM
SHEET NO. 6 OF 8
CALCULATED BY GMB DATE 8/21/81
CHECKED BY FJC. DATE 8/24/81
SCALE None

CASE 3 - 1/2 PMF pool, full HW & TW uplift, remainder same as Case 1



Overturning Forces	× Moment arm about toe =	M_R
W_D, W_H, W_F same as Case 1, sheet 2	=	335.85
TW = flood TW pressure		
$= 1/2 \times 12.2 \times 0.0624 \times 12.2 = 4.64$	$\times 12.2/3 =$	18.88
A = submerged apron pressure, where		
$K'_A = 0.120 - 0.0624 \doteq 0.058$ K/CF		
$\& K_P = 4.0$ per sheet 3		
$= 1/2 \times 10.5 \times 0.058 \times 4 \times 10.5 = 12.79$	$\times 10.5/3 =$	44.76
W_{H2} = flood HW wt		
$= 1 \times 7 \times 0.0624 =$ (0.44)	$\times (1/2 + 14) =$	6.33
	$\Sigma M_R =$	405.82

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO. 7 OF 8
CALCULATED BY FHR DATE 8/21/81
CHECKED BY F.A.C. DATE 8/24/81
SCALE None

CASE 3 OVERTURNING (cont'd)

Driving Forces	×	Moment arm about toe	=	M_D
$D_2 = V_{D_1}$ same as Case 1 sheet 3			=	83.20
$D_3 = D_2$ " " " "			=	45.33
$U_1 = U$ " " " "			=	93.60
U_2 = portion of flood uplift $\triangleq 7 \times 0.0624 \times 1 =$ (0.44)	×	1/2 + 14	=	6.33
D_1 = flood HW pressure $\triangleq 7 \times 0.0624 \times 24 = 10.48$	×	24/2	=	125.80
			ΣM_D =	354.26

$FS = \Sigma M_R / \Sigma M_D = \frac{405.82}{354.26} =$ (1.15)

Resultant from toe = $d = \Sigma M_T / \Sigma V = \frac{\Sigma M_R - \Sigma M_D}{W_D + W_{H1} + W_{H2} + W_F - U_1 - U_2}$

$d = \frac{51.56}{37.14 + 0.90 + 0.44 + 0.99 - 9.36 - 0.44} = \frac{51.56}{29.67} = 1.74'$

$d = 1.74' \times 6/15' =$ (0.126)

CASE 3 SLIDING same failure plane & theory as Case 1, sheet 3.

Resisting Forces

$\Sigma V = V_{29.67}$ per o/t above, $\therefore R_S = 29.67 \tan 32° =$ 18.54 k

Driving Forces

D_1 = flood HW pressure = per o/t above	=		10.48
D_2 = normal " " = P_1 per sheet 3	=		12.48
D_3 = submerged fill pressure = D_2 " " "	=		6.8
TW = flood TW pressure = per o/t sheet 6	=	⊖	4.64
A = submerged apron press. = " " "	=	⊖	12.79
	D_S =		12.33

$FS = R_S / D_S = 18.54 / 12.33 =$ (1.50)

Fc. JTN 5A

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO. 8 OF 8
CALCULATED BY JMB DATE 8/21/81
CHECKED BY F.A.C. DATE 8/24/81
SCALE None

CASE 4 - PMF OVERTURNING Same as Case 3, sheet 6 & 7, w/ TW EL 993.0

Resisting Forces	x Moment arm about toe	= MR
W_D, W_{H1}, W_F & A same as Case 3 sheet 6		= 380.61
W_{H2} = flood HW wt. for 1009.7 - 1000 = 9.7 = 9.7 x 1 x 0.0624 = (0.61)	x (14 1/2)	= 8.78
TW = flood TW pressure for 993 - 980 = 13.0 = 1/2 x 13 x 0.0624 x 13 = 5.27	x 13/3	= 22.85
	ΣM_R =	412.24

Driving Forces		MD
D_2, D_3 & U, same as Case 3 sheet 7		= 222.13
U_2 = portion of flood uplift ≅ 9.7 x 0.0624 x 1 = (0.61)	x 14 1/2 =	8.78
D_1 = flood HW pressure ≅ 9.7 x 0.0624 x 24 = 14.53	x 24/2 =	174.32
	ΣM_D =	405.23

$FS = \Sigma M_R / \Sigma M_D = \frac{412.24}{405.23} = (1.02)$

Resultant from toe = $d = \Sigma M_T / \Sigma V = \frac{\Sigma M_R - \Sigma M_D}{W_D + W_{H1} + W_{H2} + W_F - U_1 - U_2}$

$d = \frac{7.01}{37.14 + 0.90 + 0.61 + 0.99 - 9.36 - 0.61} = \frac{7.01}{29.67} = 0.24' \times \frac{12}{15} = (0.28)$

CASE 4 - PMF SLIDING same methodology as Case 3 sheet 7

Resisting Forces $\Sigma V = 29.67$ ∴ $R_S = 29.67$ tan 32° = 18.54k

Driving Forces

D_2, D_3 & A same as Case 3 sheet 7		= 6.49
D_1 = flood HW press. = per 0/t above		= 14.53
TW = " TW " = " " "		= ⊖ 5.27
	D_S =	15.75

$FS = R_S / D_S = 18.54 / 15.75 = (1.18)$

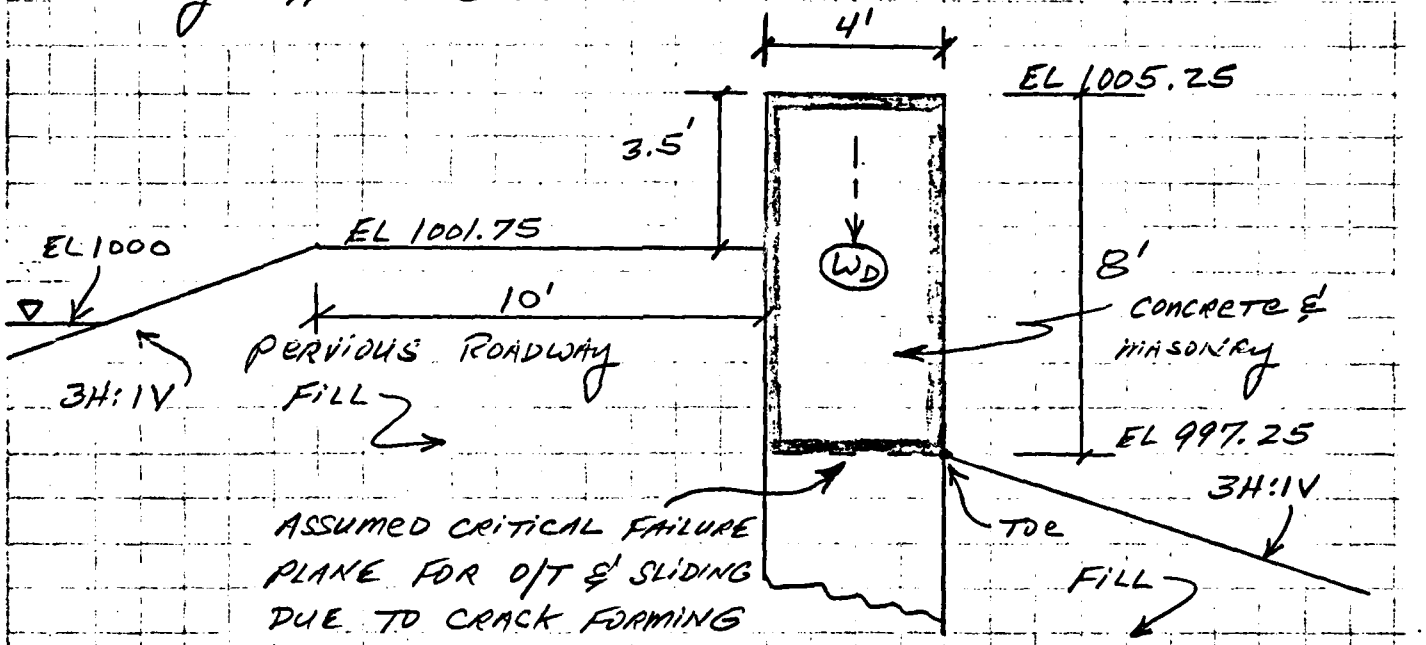
FC.... JTM. ...5A

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO. 1 OF 5
CALCULATED BY DMB DATE 8/20/81
CHECKED BY F.M.S. DATE 8/24/81
SCALE 1/4" = 1'-0"

STABILITY ANALYSIS OF DAM

CROSS SECTION FOR ANALYSIS - To right of spillway at about Sta 3+40 where exposed, unsupported d/s height is greatest (see Photo A-5B). Dimensions based on rough field measurements and to lesser extent on drawing Appendix G-1.



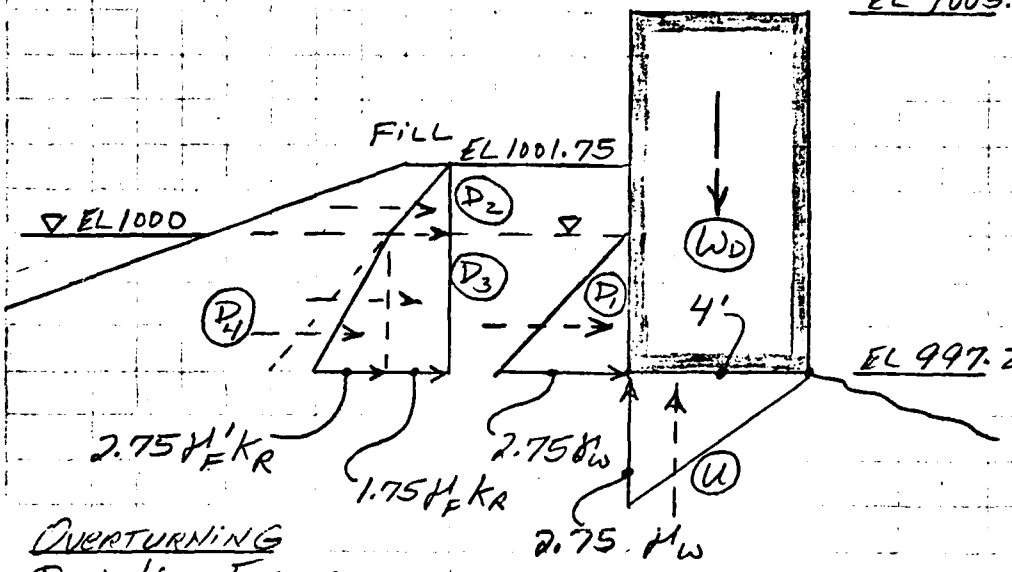
Dead Load	Volume	× Unit wt.	= W	× Horiz. Moment Arm about toe	= M
W_D	4 × 8 × 1	× 0.150 kcf (concrete)	= 4.8 K	× 4/2	= 9.6 Ft-k

W_D → ΣM →

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO 2 OF 5
CALCULATED BY JMB DATE 8/20/81
CHECKED BY F.A.C. DATE 8/24/81
SCALE None

CASE 1 - Normal pool at spillway crest, no TW, full HW uplift, fill to 3.5' below top on u/s side.



OVERTURNING

Resisting Forces

Only W_D = (4.8)k, ΣM_R = 9.60 Ftk per sheet 1

Driving Forces × Moment arm about toe = M_D

D_1 = normal HW pressure
= 1/2 × 2.75 × 0.0624 × 2.75 = 0.24 k × 2.75/3 = 0.22

D_2 = fill pressure, where γ_F = 130 #/CF = 0.130 k/CF
= $\gamma' K_R$ = coeff. of horiz. earth pressure at rest = 0.5
= 1/2 × 1.75 × 0.130 × 0.5 × 1.75 = 0.10 × (1.75/3 + 2.75) = 0.33

D_3 = submerged fill pressure = 1.75 × 0.130 × 0.5 × 2.75
= 0.31 × 2.75/2 = 0.43

D_4 = " " " where γ_F' = 130 - 62.4 = 67.6, say 68 #/CF = 0.068 k/CF
= 1/2 × 2.75 × 0.068 × 0.5 × 2.75 = 0.13 × 2.75/3 = 0.12

U = normal HW uplift
= 1/2 × 2.75 × 0.0624 × 4 = (0.34) × (4 × 2/3) = 0.92

ΣM_D = 2.02

FS = $\Sigma M_R / \Sigma M_D$ = 9.60/2.02 = (4.75)

Resultant from toe = d = $\Sigma M_T / \Sigma V$ = $\frac{\Sigma M_R - \Sigma M_D}{W_D - U}$ = 7.58/4.46 = 1.70'

d = 1.70' × b/4' = (0.42b)

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO 3 OF 5
CALCULATED BY JMB DATE 8/20/81
CHECKED BY F.A.C. DATE 8/24/81
SCALE None

CASE 1 SLIDING Assume sliding along cracked concrete

Resisting Forces

R_S = Horiz. resisting force = $\Sigma V \tan\phi + C$ (Reference 1)

where C = Cohesion along failure plane = 0

ϕ = Angle of sliding friction $\cong 45°$ Assumed

ΣV = vertical effective force

= 4.46 k per o/t above

$R_S = 4.46 \tan 45° = 4.46$ k

Driving Forces

D_1 = Normal HW pressure = per sheet 2 = 0.24 k

D_2 = fill pressure = " " " = 0.10

D_3 = submerged fill pressure = " " " = 0.31

D_4 = " " " = " " " = 0.13

horiz. driving force = D_S = 0.78 k

$FS = R_S / D_S = 4.46 / 0.78 =$ (5.72)

CASE 2 - Normal pool plus ice load.

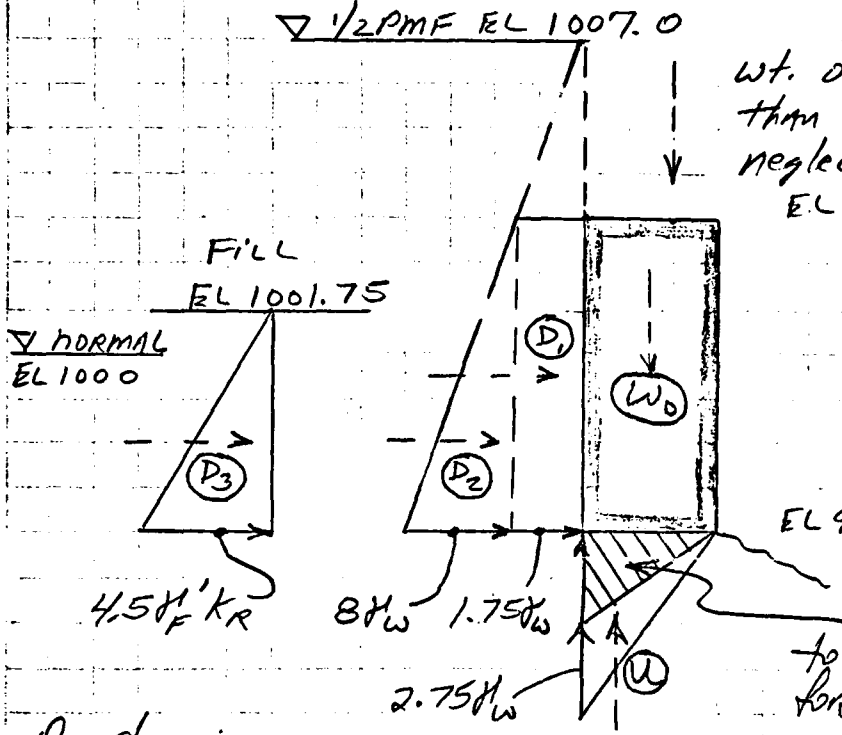
N/A, same as Case 1, since ice acts against the upstream side of the roadway fill. This force cannot effectively be transmitted through the fill. Ice will not be present during higher water stages unless flashboards are deliberately added.

FC 3TN 5A

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO. 4 OF 5
CALCULATED BY JMZ DATE 8/21/81
CHECKED BY F.A.C. DATE 8/24/81
SCALE None

CASE 3 - 1/2 PMF Pool, full Hw uplift, remainder same as Case 1.



Overturning

Only resisting force = W_D = (4.8 k) → ΣM_R = 9.60 Ft-k sheet 2

Driving Forces × Moment Arm about toe = M_D

D_1 = flood HW pressure
= 1.75 × 0.0624 × 8 = 0.87 × 8/2 = 3.49

D_2 = 1/2 × 8 × 0.0624 × 8 = 2.00 × 8/3 = 5.32

D_3 = submerged fill pressure
= 1/2 × 4.5 × 0.068 × 0.5 × 4.5 = 0.34 × 4.5/3 = 0.52

U = normal HW pressure = 0.34k per sheet 2 = 0.92

ΣM_D = 10.25

$FS = \Sigma M_R / \Sigma M_D = \frac{9.60}{10.25} = (0.94)$

Resultant from base = $d = \Sigma M_R / \Sigma V = \frac{\Sigma M_R - \Sigma M_D}{W_D - U} = \frac{-0.65}{4.46}$

$d = -0.15 \times 6/4 = (-0.046)$

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CAPE POND DAM
SHEET NO. 5 OF 5
CALCULATED BY PAR DATE 8/21/81
CHECKED BY F.B.S. DATE 8/24/81
SCALE None

CASE 3 - SLIDING same theory as Case 1, sheet 3

$\Sigma V = 4.46$, $\therefore R_S = 4.46 \tan 45^\circ = 4.46$ k

Driving Forces

D_1 = per sheet 4 = 0.87
D_2 = " " " = 2.00
D_3 = " " " = 0.34
D_S = 3.21 k

$FS = R_S/D_S = \frac{4.46}{3.21} = (1.39)$

CASE 4 - PMF OVERTURNING same methodology as Case 3

$\Sigma M_R = 9.60$ due to only WD

Driving Forces

D_2, D_3 & U same as Case 3, sheet 4 → = 6.76

D_1 = flood HW pressure, 1009.7 - 1005.25 = 4.45

$4.45 \times 0.0624 \times B = 2.22 \times B/2 = 8.89$

$\Sigma M_D = 15.65$

$FS = \Sigma M_R/\Sigma M_D = \frac{9.60}{15.65} = (0.61)$

Resultant from toe = $d = \Sigma M_T/\Sigma V = \frac{\Sigma M_R - \Sigma M_D}{\Sigma V \text{ Case 3}} = \frac{-6.05}{4.46}$

$d = 1.36' \times 6/4 = (-0.34 6)$

CASE 4 - SLIDING same methodology as Case 3

$\Sigma V = 4.46$, $\therefore R_S = 4.46 \tan 45^\circ = 4.46$ k

Driving Forces

D_2 & D_3 same as Case 3 above = 2.34
D_1 = per o/t above = 2.22
D_S = 4.56 k

$FS = R_S/D_S = 4.46/4.56 = (0.98)$

Form JM-45A

APPENDIX E

REFERENCES

CAPE POND DAM, NY 00265

PHASE I INSPECTION REPORT

REFERENCES

This is a general list of references pertinent to dam safety investigations. Not all references listed have necessarily been used in this specific report.

"Engineering and Design, National Program For Inspection of Non-Federal Dams", ER 1110-2-106, Dept. of the Army, Office of the Chief of Engineers, 26 September 1979, with Change 1 of 24 March 1980. Included as Appendix D of the ER is "Recommended Guidelines For Safety Inspection of Dams".

"HEC-1 Flood Hydrograph Package, Users Manual", The Hydrologic Engineering Center, U.S. Army Corps of Engineers, January 1973.

"Flood Hydrograph Package (HEC-1), Users Manual for Dam Safety Investigations", The Hydrologic Engineering Center, U.S. Army Corps of Engineers, September 1978.

HMR 33, "Seasonal Variations of Probable Maximum Precipitation, East of the 105th Meridian for Areas 10 to 1000 Square Miles and Durations from 6 to 48 Hours," U.S. Dept. of Commerce, NOAA, National Weather Service, 1956.

HMR 51, "All-Season Probable Maximum Precipitation, U.S. East of 105th Meridian for Areas from 1000 to 20,000 Square Miles and Durations from 6 to 72 Hours", U.S. Dept. of Commerce, NOAA, National Weather Service, 1974.

NWS-35, "Five-to-60 Minute Precipitation Frequency for the Eastern and Central United States", U.S. Dept. of Commerce, NOAA, National Weather Service, June 1977.

"Technical Paper No. 40, Rainfall Frequency Atlas of the United States", U.S. Dept. of Commerce, Weather Bureau, 1961.

Design of Small Dams, United States Dept. of the Interior, Bureau of Reclamation, Second Edition, 1973, Revised Reprint, 1977.

Linsley, Horace W. and Brater, Ernest F., Handbook of Applied Hydraulics, fifth edition, McGraw-Hill Book Co., Inc., New York, N. Y., 1963.

"Standard Hydrograph Analyses and Computations", EM 1110-2-1405, U.S. Army Corps of Engineers, 31 August 1959.

11. "Technical Release No. 55, Urban Hydrology for Small Watersheds", U.S. Dept. of Agriculture, Soil Conservation Service (Engineering Division), January 1975.

12. National Engineering Handbook, Section 4, Hydrology, U. S. Dept. of Agriculture, Soil Conservation Service, August 1972.

13. "Hydraulic Design of Spillways", EM 1110-2-1603, U.S. Army Corps of Engineers, 31 March 1965, with Change 1 included.

14. "Standard Project Flood Determinations", EM 1110-2-1411, U.S. Army Corps of Engineers, 26 March 1952.

15. "Hydrologic and Hydraulic Assessment", Appendix D of EC 1110-2-188, U.S. Army Corps of Engineers, 30 December 1977.

16. "Reviews of Spillway Adequacy, National Program of Inspection of Non-Federal Dams", ETL 1110-2-234, U.S. Army Corps of Engineers, 10 May 1978.

17. Hammer, Mark J., Water and Waste-Water Technology, John Wiley & Sons, Inc., New York, 1975.

18. "Hydraulic Charts For the Selection of Highway Culverts", Hydraulic Engineering Circular No. 5, U.S. Department of Commerce, Bureau of Public Roads, December 1965.

19. "Guide for Making a Condition Survey of Concrete in Service", American Concrete Institute (ACI) Journal, Proceedings Vol. 65, No. 11, November 1968, pages 905-918.

20. "Lower Hudson River Basin, Hydrologic Flood Routing Model", New York District, Corps of Engineers, January 1977.

21. "Climatological Data, Annual Summary, New York, 1979", Volume 91, No. 13, National Oceanic and Atmospheric Administration, Asheville, North Carolina.

22. "Climatological Data, New York, September 1980", Volume 92, No. 9, National Oceanic and Atmospheric Administration, Asheville, North Carolina.

23. "Water Resources Data For New York, Water Year 1979", Volume 1, USGS Water-Data Report NY-79-1, U.S. Geological Survey, Albany, New York, 1980.

24. "Maximum Known Stages and Discharges of New York Streams Through 1973", Bulletin 72, U.S. Geological Survey, 1976.

25. "Characteristics of New York Lakes (Gazetteer)", Bulletin 68, U.S. Geological Survey and NYS Department of Environmental Conservation, 1970.

26. "Gravity Dam Design", EM 1110-2-2200, U.S. Army Corps of Engineers, 25 September 1958, with Changes 1 & 2 included.

27. "Gravity Dam Design - Stability", ETL 1110-2-184, U.S. Army Corps of Engineers, 25 February 1974.

28. Rich, J.L., "Glacial Geology of the Catskills", New York State Museum Bulletin No. 299, University of the State of N.Y., Albany, N.Y., December 1934.

29. Geologic Map of New York, Lower Hudson Sheet, New York State Museum and Science Service, University of the State of N.Y., State Education Dept., Albany, N.Y., reprinted 1973.

30. "Landforms and Bedrock Geology of New York State", New York State Museum and Science Service, University of the State of N.Y., State Education Dept., Albany, N.Y., reprinted 1973.

31. Terzaghi, Karl and Peck, Ralph B., Soil Mechanics in Engineering Practice, second edition, John Wiley & Sons, Inc., New York, N.Y., 1967.

32. Chow, Ven Te, Open-Channel Hydraulics, McGraw-Hill Book Company, Inc., New York, N.Y., 1959.

APPENDIX F

AVAILABLE ENGINEERING DATA AND RECORDS

TABLE OF CONTENTS

	Section
Location of Available Engineering Data and Records	F1
Checklist for General Engineering Data and Interview with Dam Owner	F2
Copies of Engineering Data and Records	F3

APPENDIX F

SECTION F1

LOCATION OF AVAILABLE ENGINEERING DATA AND RECORDS

1. Owner: Cape Pond, Inc.
   Cape Road
   Ellenville, NY 12428
   Attn: William H. Lyons, President
   Lyons Road
   Milton, NY 12547
   914-795-5164

   Available: Possibly some photos before & after replacement of concrete sills of Gates 1 & 2 in Summer 1978.

   Attn: Andrew T. Jacob, Operator
   Box 21A, Cape Pond Rd.
   Ellenville, NY 12428
   914-647-3207

   Available: Daily log from May 1979 to present, with water levels over the spillway and road recorded.

2. Designer: Unknown.

3. Construction Contractor: Mr. VanKeuren
   Ellenville, NY (deceased)

4. Designer for 1914 Modifications:

   J. H. Divine
   Ellenville, NY
   (business status unknown, not contacted)

5. Construction Contractor for 1914 Modifications: Unknown.

6. Construction Contractor For 1970 Repairs on Gate 1:

   McDole Construction Co.
   Wawarsing, NY (now retired)

7. Agency: NYS Department of Environmental Conservation
   50 Wolf Road
   Albany, NY 12233
   Attn: George Koch, P.E., Chief, Dam Safety Section
   518-457-5557

   Available: Drawing, inspection reports, and construction application and letters concerning 1914 modifications.

4585

PHASE I INSPECTION

CHECKLIST FOR GENERAL ENGINEERING DATA
& INTERVIEW WITH DAM OWNER

Name of Dam Cape Pond Dam Fed. Id.# NY 00265

Date April 8, 1981 Interviewer(s) Thomas P. Bennedum

Dam Owner/Representative(s) Interviewed, Title & Phone#

William H. Lyons, Pres. Cape Pond, Inc., Home 914-795-5164 Bus. 914-562-5780

Sherman B. Loucks, Member, 914-647-5254, Thomas H. Clark, Member & Operator (see below) 914-562-6213

1. OWNERSHIP (name, title, address & phone #)

Cape Pond, Inc., Cape Rd., Ellenville, NY 12428

Attn: William H. Lyons, President, Lyons Rd., Milton, NY 12547 914-795-5164 (near Newburgh)

2. OPERATOR (name, title, address & phone # of person responsible for day-to-day operation)

Andrew T. Jacob, Box 21A, Cape Pond Rd., Ellenville, NY 12428, 914-647-3207 (Hse. next to left abutment)

a. Operator Full/Part time Part time (DEC Forest Ranger, w/ Region 3, New Paltz, full time)

3. PURPOSE OF DAM

a. Past Constructed for hydro storage by DWIGHT DIVINE & SONS (Ulster Knife Co.), but never used. 1949 Divine died & employees formed Corp. & bought dam & property.

b. Present Recreation, restricted to Corp. members & one private family owning property abutting Lake & part of Lake. Also, one other parcel w/111' of frontage, which is presently in dispute.

4. DESIGN DATA

a. Designed When unknown, except prior 1904 ±

b. By (name, address, phone #, business status)

unknown

c. Geology Reports None known

d. Subsurface Investigations None known

e. Design Reports/Computations (H&H, stability, seepage)

None known

f. Design Drawings (plans, sections, details) None known

g. Design Specifications None known

h. Other 1914 modification drawing (see Appendix G-1) show some details of original design.

5. CONSTRUCTION HISTORY

a. Initial Construction

1) Completed When Unknown, except prior 1904±

2) By (name, address, phone #, business status) Mr. VanKeuren, Ellenville, NY (deceased)

3) Borrow Sources/Material Tests Cement from Rosendale Cement Works near Kingston NY (not in business now) Also supplied Brooklyn Bridge.

4) Construction Reports/Photos None known

5) Diversion Scheme/Construction Sequence Unknown

6) Construction Problems None known

7) As-Built Drawings (plans, sections, details) None known

8) Data on Electrical & Mechanical Equipment Affecting Safe Operation of Dam Only electric is for outside lights. No data on gate mechanisms.

9) Other n/a

4576

b. Modifications (review design data & initial construction items as applicable & describe) • 1914 replaced plank & stone crib apron w/ grouted in stone & constructed concrete ogee to below exist. spillway. Engineer was J. H. Divine, Ellenville, NY (business status unknown). Contractor unknown. See Appendix F3-4 thru F3-14 & drawing on Appendix G-1. Work was finished in 1915.

c. Repairs & Maintenance (review design data & initial construction items as applicable & describe) • 1970 repaired gate #1 (nearest left), replaced part of #1 outlet conduit & encased rest in concrete, & rearranged & dressed up rock fill on d/s side. No plans & no records except bills. Contractor was McDole Const. Co., Wawarsing, NY (now retired) "McDole Kelly 1970" cast in concrete (see 9-OTHER)

6. OPERATION RECORD

a. Past Inspections (dates, by, authority, results)

• Aug. 3, 1914 by NYS Cons. Comm. (see App. F3-1)

• Aug. 22, 1972 by NYS-DEC (see App. F3-18) Last Record

b. Performance Observations (seepage, erosion, settlement, post-construction surveys, instrumentation & monitoring records) • Present seepage same as 20 yrs. ago.

• Gates leak, #2 leaks more.

c. Post-Construction Engineering Studies/Reports

None known

d. Routine Rainfall, Reservoir Levels & Discharges May 1979 - present Operator has kept daily log (for security) & has noted when W.L. is over road or spillway. Will try to send copy of pages.

4564

e. Past Floods That Threatened Safety (when, cause, discharge, max. pool elevation, any damage) • Aug.-Sept. 1955 W.L. some distance above top of core wall (dam). No damage.
• Early 1970's heavy storm caused failure of (see 9-OTHER)

f. Previous Failures (when, cause, describe) None known

g. Earthquake History (seismic activity in vicinity of dam) None known

7. VALIDITY OF DESIGN, CONSTRUCTION & OPERATION RECORDS (note any apparent inconsistencies) • Dwg. App. G-1 shows dam length as 697.5'. Measures 612', but ends of core wall probably underground.
• No gate houses shown on dwg.
• Dwg. shows 14 piers in spillway. Only has 11 piers, 3 piers missing & openings wider than rest.

8. OPERATION & MAINTENANCE PROCEDURES

a. Operation Procedures in writing? No Obtain copy or describe. (reservoir regulation plan, normal pool elevation and status of operating facilities, who operates & means of communication to controller, mode of operating facilities, i.e., manual, automatic, remote) • Early 1900's suit brought by Geiger who was flooded because Divine had flashboards on spillway. Court decision established W.L. at "paint mark" at left of dam (i.e., at spillway crest per level shots). Owner has standing order (see F2-6)

b. Maintenance Procedures in writing? No Obtain copy or describe. • Since 1975 been a dam committee (chairman + 2 members + Lyons + operator). Either chairman or members look at dam once/wk. Operator looks daily.
• Each summer, various members do miscell.
(cont'd on F2-6)

c. Emergency Action Plan & Warning System in Writing? No
Obtain copy or describe. (actions to be taken to minimize the D/S effects of an emergency)

- Feel that flood control project in Ellenville (stream channelization & conc. flood walls) provides protection.
- If situation arose, would call Ellenville Police Dept. & Mayor.

9. OTHER

5c) Repairs & Maintenance • (1970 cont'd) on top of d/s end of outlet conduit #1. Kelly was either sand supplier or crane operator.
- Summer 1978 replaced bottom concrete sill gate #2. Work done by members. Owner has some photos before/after & will try to locate them.
- 1975 & 1975 got estimate to gunite d/s face of spillway & exposed core wall. Work never done, too expensive.

6a) Past Inspections
- Various informal inspections by members' friends who are engineers but no written reports produced.
- Dam may have been looked at by COE during flood control work in Ellenville in 1955 & in early 1970's.

6e) Past Floods • (early 1970's cont'd.) Ulster Heights Dam (earthen) u/s, which caused Cape Pond to be o/t by unknown amount.
- 1977-78 Ulster Hts. Dam failed again because of storm, but Cape Pond not o/t.
- March 6, 1980 flood caused w.l. 1"-2" above step in u/s concrete wall at left of dam (i.e., about 2.8' above spillway crest based on level shots).
- In 25 yrs. of memory, water has never flooded camps.

C. T. MALE ASSOCIATES, P.C.
ENGINEERS SURVEYORS ARCHITECTS
LANDSCAPE ARCHITECTS PLANNERS
3000 TROY ROAD, SCHENECTADY, N.Y. 12309
(518) 785-0976

JOB CARE POND DAM
SHEET NO 1 OF 1
CALCULATED BY JMB DATE 4/8/81
CHECKED BY JMB DATE —
SCALE n/a

8a) Operation ... that this level be maintained. Operator uses his discretion as to how to maintain this level.

- Normally both gates closed. No flashboards on spillway. Old F&B. hinge pins on piers & pipe sockets on crest (some mortared)
- Try to maintain W.L. @ "paint mark" (i.e., slightly below road across dam) from April thru Nov. 1. Use gate #1 (near left) primarily & gate #2 only during high water. #1 works more easily than #2. #2 only used twice: March 6, 1980 & Feb 20, 1981.
- Both gates are operated manually. Gate #1 sill is 18' below top of core wall & opens about 40" max. Gate #2 sill is 12' below top of core wall & opens about 2' max. Both gates are on 48" ϕ outlet conduits.
- After Nov. 1 W.L. quickly dropped to level of gate sills to inspect gates, sills & any other items & then W.L. allowed to rise.
- Nov. 1 to April 1 try to maintain W.L. about 2' below "paint mark" (spillway crest) primarily to help in weed control.
- Will open gates in anticipation of heavy flows due to storms. From experience, 2"-3" of rain causes about a 6" rise in W.L. about 24 hr. later.
- With both gates open, requires about 36 hr. to drop W.L. to old channel, essentially draining all storage.

8b) Maintenance ... concrete patching on ogee & core wall. Work is evident.

- Each year about 30-40 tons of "clay" dumped on u/s side. Dumped on road and doked in. Done by variety of local contractors.

8c) Emergency Action Plan

- Stream drops 70' to Wilsm's market @ end of Cape Rd.
- Club owns alternate parcels d/s to junk yard about 3½ miles d/s

F2-6

FCTN 35A

APPENDIX F

SECTION F3

COPIES OF ENGINEERING DATA AND RECORDS

TABLE OF CONTENTS

	Page
Inspection Report, by NYS Conservation Commission (Richard L. Hyde) - August 3, 1914	F3-1
Letter Concerning 1914 Modifications, by J. H. Divine - September 18, 1914	F3-4
Application For Construction of 1914 Modifications, by J. H. Divine - September 22, 1914 (includes Report on Completion of Work, by Alex Rice McKim, NYS Conservation Commission, August 13, 1915 on F3-11 & 12)	F3-6
Letter Approving Plans for 1914 Modifications, by NYS Conservation Commission - September 29, 1914	F3-13
Inspection Report, by NYS-DEC, August 22, 1972	F3-15
Memorandum on August 22, 1972 Inspection, by Robert Ryczek (NYS-DEC) - August 23, 1972	F3-18
Letter Requesting Inspection, by Cape Pond, Inc. (William H. Lyons) - December 20, 1977	F3-20

178
Map 163
Dam 751 L H

FORM IWM. 6 18 12 2000 (16-15278)

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

DAM REPORT

August 3, 1914
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the The Cape Dam.

This dam is situated upon the Beer Kill
(Give name of stream)
in the Town of Canaan, Columbia County,
about 3 miles from the Village or City of E Chatham.
(State distance)
The distance down stream from the dam, to the Kinderhook Creek,
(Up or down) (Give name of nearest important stream or of a bridge)
is about 4 miles.
(State distance)

The dam is now owned by Dwight Lamb
(Give name in full)
and was built in or about the year ____, and was extensively repaired or reconstructed during the year 1914.

As it now stands, the spillway portion of this dam is built of concrete
(State whether of masonry, concrete or timber)
and the other portions are built of concrete & masonry
(State whether of masonry, concrete, earth or timber with or without rock fill)

As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is ____ and under the remaining portions such foundation bed is ____.

DEC

F3-1

The total length of this dam is 485 feet. The spillway or waste-weir portion, is about 140 feet long, and the crest of the spillway is about 5 feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: one 4 inch pipe in north wing and one gate in north wing

State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

The dam is of very good construction and in very good condition

Reported by Richard L. Hyde
(Signature)

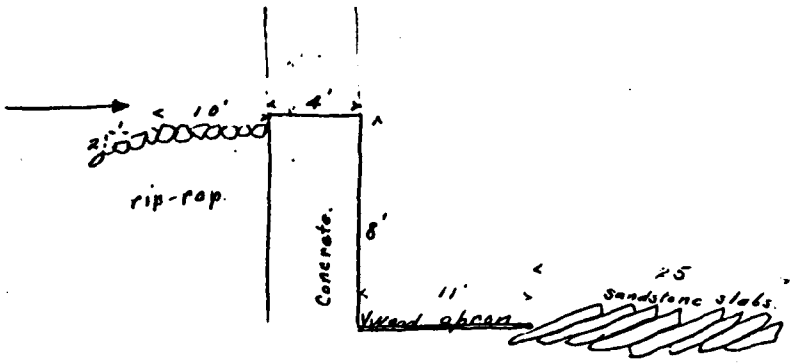
(Address—Street and number, P. O. Box or R. F. D. route)

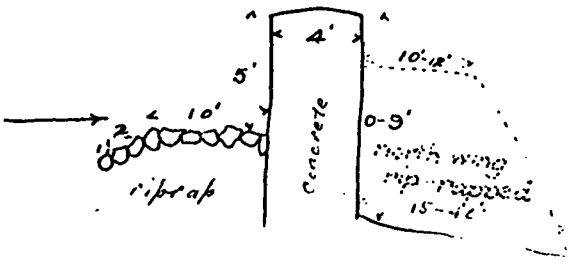
(Name of place)

(SEE OTHER SIDE)

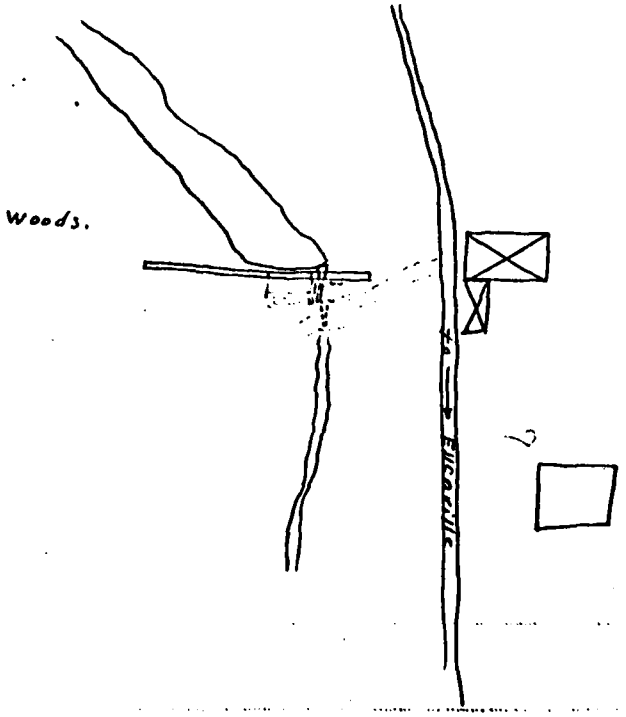
DEC

(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)





(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.



DEC

1

DWIGHT DIVINE. JOHN H. DIVINE CHARLES DWIGHT DIVINE.

DWIGHT DIVINE & SONS.

Proprietors of Ulster Knife Company

TRADE MARKS:
ULSTER KNIFE CO.
ELLENVILLE KNIFE CO.

MANUFACTURERS OF

Fine Pocket Cutlery.

Ellenville, N.Y.

Sept. 18th, 1914.

The Conservation Commission,

Albany, N.Y.

Attention of Mr. A. R. Mc Kim:-

Gentlemen:-

As discussed with Mr. Mc Kim on his visit of inspection here this Spring, we contemplate the replacement of the plank and stone crib apron of our dam at the Cape, this town, on north branch of Beerkill Creek, with concrete construction and the incidental reinforcement of the dam by continuing the concrete work on the conventional "o g" curve to the spillway ~~Kent~~ crest.

The writer expects to be in Albany on Tuesday and Wednesday next (September 22nd & 23rd) and would be glad to go over our plans in detail with Mr. Mc Kim at any time on either of the dates noted. If this arrangement is satisfactory, kindly make an appointment by return mail or wire us.

Owing to the lateness of the season, it is

DEC

JOHN H. DIVINE CHARLES DWIGHT DIVINE.

DWIGHT DIVINE & SONS.

Proprietors of Ulster Knife Company

TRADE MARKS:
ULSTER KNIFE CO.
ELLENVILLE KNIFE CO.

MANUFACTURERS OF

Fine Pocket Cutlery.

Ellenville, N.Y. Sept. 18th, 1914.

The Conservation Commission--#2.

desirable that the work, if done this fall, be gotten under way as soon as possible.

Yours very truly,

DWIGHT DIVINE & SONS.

BY J.H. Divine

JHD/AMS

F3-5

ORIGINAL

Acc. 353. Form No. IW58. 8-7-14-1000 (16-18116)

RECEIVED
SEP 22 1914
DIVISION OF INLAND WATERS

ORIGINAL

STATE OF NEW YORK

Dam No. 751
Lower Hudson
DIVISION OF INLAND WATERS

GEORGE E. VAN KENNEN, CHAIRMAN
JAMES W. FLEMING, Civil Engineer
JOHN D. MOORE, COMMISSIONERS
ALBERT E. HOYT, SECRETARY
JOHN J. FARRELL, ASST. SECRETARY

JOHN D. MOORE, COMMISSIONER
JAMES J. FOX, DEPUTY COMMISSIONER
RICHARD W. SHERMAN, CHIEF ENGINEER
ALEX. RICE McKIM, INSPECTOR OF DOCKS AND DAMS

CONSERVATION COMMISSION
ALBANY

Serial No. 176

Application filed Sept 22 - 1914

Approved by Commission Sept 25 - 1914

Material Tag No.

Foundations inspected

Final inspection

APPLICATION FOR CONSTRUCTION OR RECONSTRUCTION OF A DAM

Ellenville N.Y.
(Address of Applicant)

Application is hereby made to the Conservation Commission of the State of New York, in compliance with the provisions of Chap. LXV of the Consolidated Laws, the Conservation Law, for approval of the detailed specifications and plans, marked Plans of proposed Concrete Spillway for Cape Pond Dam herewith submitted, for the {~~construction~~ / reconstruction} of the dam herein described. All provisions of law will be complied with in the erection of the said dam, whether specified herein or not.

Sept 22, 1914
(Date)

{Signature of Applicant} Dwight Divine Board
J H Divine

DEC

F3-6

LOCATION AND GENERAL DATA

Site of dam is on North Branch of Good Beer Kill
(Name of stream)
a branch of Rondout (via Sandburgh) Creek within the
(Name of stream)
limits of the town of Wawarsing, County of Ulster

(Give approximate distance from well-known bridge, dam, village or mouth of stream, so that work can be located on map of state)

Purpose of dam Storage of flood waters

Reasons for making changes in existing structure Reinforcement and lowering of maintenance

DATA AND DIMENSIONS

General:

Nature of foundations Hard pan - Clay

Materials of which dam is to be constructed Concrete

Area of watershed above dam Twenty two square miles

Area of water surface of pond at level of spillway crest 275 acres.

Capacity of reservoir (at above level) 60,000,000 cubic feet.

Length of spillway crest 150' (136' effective) feet.

Maximum depth of water on spillway crest 4' feet.

Maximum discharging capacity of spillway 4600 cubic feet per second.

Maximum discharging capacity of spillway per square mile of drainage area 88.2 cubic feet per second.

DEC

Masonry or timber portion:

Length on top 697.5 feet.

Length in stream bed 75 feet.

Maximum height above stream bed 19.75 feet.

Maximum height above foundation bed 24.25 feet.

Maximum width of base 14 feet.

Maximum width of top 5 feet.

Elevation of top above maximum water level in pond 2 feet.

Elevation of top above spillway crest 5 feet.

Earth portion:

Embankment:

Length on top ..... feet.

Length in stream bed ..... feet.

Maximum height above stream bed ..... feet.

Maximum width of base ..... feet.

Maximum width of top ..... feet.

Elevation of top above maximum water level in pond ..... feet.

Elevation of top above spillway crest ..... feet.

Slope, upstream face .....

Slope, downstream face .....

Core wall:

Material .....

Elevation of top above spillway crest ..... feet.

Width of top ..... feet.

Batter of faces .....

Maximum height above foundations ..... feet.

Maximum width of base ..... feet.

PEC

Sheeting or other cut-off.....

.....

.....

Is fish way provided? No

General description of regulating works, gate houses, outlet pipes, penstocks, forebays, canals, flashboards, gates, log chutes, etc.

2' high hinged flash boards.
2 - 48" waste gates (see plan) fitted with screw gear lifts.

.....

Names of owners of property which will be submerged by construction of dam, with approximate submerged area owned by each.

Dwight Divine, 2.40 acres
A. R. McDonnell and others 3.5 acres

.....

It is intended to complete work covered by this application by Nov 15, 1914 (Date)

REPORT UPON APPLICATION

CONSERVATION COMMISSION — DIVISION OF INLAND WATERS

Albany Sept 22 - 1914

I have carefully examined the plans of the above dam, and find that if the work is constructed in accordance with the plans filed Sept 22 - 1914, with good workmanship and the specified materials, that it will be safe.

Approved:

R W Sherman
Chief Engineer.

Allen Rice McKeen
Inspector of Docks and Dams.

DEC

APPROVAL BY COMMISSION

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

On Sept 25 1914 the Conservation Commission, by resolution duly adopted, approved of the above application for the { ~~construction~~ / reconstruction } of dam 751 Lower Hudson on Good Bier Kill and hereby gives permission for the { ~~construction~~ / reconstruction } of said dam within 12 months from date in accordance with the specifications and plans, and subject before erection to the approval by the Inspector of the materials of construction and of the foundation bed when stripped and prepared, and subject to the inspection of the work during and after construction. This approval may be amended if deemed necessary to secure a safe structure.

(Seal)

Secretary to Commission.

REPORT ON INSPECTION OF FOUNDATION

CONSERVATION COMMISSION — DIVISION OF INLAND WATERS

Albany.....

Work on the above dam was started....., contracts for the same having been awarded to.....

.....

On.....

.....

.....

.....

Approved:

Inspector of Docks and Dams.

.....

Chief Engineer.

DEC

F3-10

REPORT ON COMPLETION OF WORK

CONSERVATION COMMISSION — DIVISION OF INLAND WATERS

Ellenville Aug 13-15

Albany.....

On Aug 13-15 .....I inspected the above work and found that it had been completed in a satisfactory manner.

Approved: Alex Rietmeyer

Inspector of Docks and Dams.

.....

Chief Engineer.

INSTRUCTIONS TO APPLICANTS

Requirements for Plans.— Before beginning the construction, reconstruction, alteration or extension of a structure for impounding water, the owner of the proposed structure shall submit, in duplicate, to the Conservation Commission complete drawings showing the location of the dam, the flow line of the impounded water, the boundary lines and the ownership of the property affected, the nature of the foundation bed, the character of the materials to be employed, the size and the location of the discharge and control gates, the general and special features of the dam, and such dimensions as are necessary for the calculation of the stresses and the erection of the structure.

Drawings shall be on sheets of uniform size 24 inches wide by 36 inches long. Each sheet shall have a white space 3 inches high by 6 inches long below the title to receive the stamp of approval. On each sheet of every set of drawings there shall be clearly printed a conspicuous title in which shall appear the name of the county, the name of the city, village or town, and the name of the stream in which the dam is located, and the name of the owner thereof. The scale of the drawings shall be stated under the title. When the designs have been approved by the Commission, one set will be returned to the owner, with such approval endorsed thereon. Copies in duplicate of the specifications under which the dam is to be constructed shall accompany the plans.

Inspection.— The name of the inspector and a statement of his experience in such work must be sent to the Commission. There must also be sent a sample of at least one-half a cubic foot of sand and twenty cubic inches of the stone for concrete or masonry to be used in the structure, and of the natural materials in the foundation bed. The foundation bed, after it has been cleared and prepared, must be inspected subject to approval by the Inspector of the Commission. The inspection of materials takes about ten days in the laboratory. On request tags will be sent for labeling the materials.

DEC

Oct. 2-14. Present apron well filled crib about 2 ft deep • well back up with large stones to top ——— [cont.] G R M & C.
Aug 13-65. Water at spill. Work finishing. Concrete good.

DEC

126

Sept. 29, 1914.

Dwight Divine & Sons,

Ellenville, N. Y.

Gentlemen:-

Enclosed you will find print of plan for dam known in our records as Serial #176, Dam #751, Lower Hudson River Watershed.

Upon the plan you will find a certificate signed by the Secretary to the Commission stating that by a duly adopted resolution your plans and specifications have been approved in accordance with the provisions of Section 22 of the Conservation Law.

You will also find enclosed copy of the resolution, which please read carefully and acknowledge receipt.

Yours truly,

CONSERVATION COMMISSION,

By,

_____

HWS/F

Secretary to Commission.

DEC

OR
R.M.S 176

WHEREAS, Dwight Divine & Sons of Ellenville, N. Y., did on the 22nd day of September, 1914 submit plans and specifications for the reconstruction of a dam on the North Branch of Good Bier Kill, a branch of the Rondout Creek within the limits of the town of Warwarsing, said dam being known in Conservation Commission records as Dam #751 Lower Hudson River Watershed; and did by Conservation Commission serial #176 make application for the approval of said plans and specifications under the provisions of the Conservation Law, and

WHEREAS, said plans and specifications have been approved by the Chief Engineer and the Inspector of Docks and Dams and said plans signed by them respectively, Now, Therefore, Be it

RESOLVED, that said plans and specifications be and hereby are approved, provided however that this resolution shall not be deemed to authorize any invasion of any property rights, public or private, by any person in carrying out the requirements of this resolution, nor to create any claim or demand against the State of New York.

DEC

DEC DAM INSPECTION REPORT

RB	CTY	YR. AP.	DAM NO.	INS. DATE	USE	TYPE
11	56	14	0007511	08/22/72	002	4

LIGHT.

AS BUILT INSPECTION

1 Location of Spillway and outlet	1 Elevations
1 Size of Spillway and outlet	1 Geometry of Non-overflow section

1 GENERAL CONDITION OF NON-OVERFLOW SECTION

2 Settlement	2 Cracks	2 Deflections
2 Joints	2 Surface of Concrete	2 Leakage
2 Undermining	2 Settlement of Embankment	2 Crest of Dam
2 Downstream Slope BRUSH	1 Upstream Slope	2 Toe of Slope

GENERAL CONDITION OF SPILLWAY AND OUTLET WORKS

2 Auxiliary Spillway	2 Service or Concrete Spillway	2 Stilling Basin BRUSH
2 Joints	2 Surface of Concrete	2 Spillway Toe
2 Mechanical Equipment	4 Plunge Pool	2 Drain

2 Maintenance	B Hazard Class
3 Evaluation	-4 Inspector

COMMENTS:

ALL EXPOSED CONCRETE SURFACES SCALD AND CRACKED WITH SOME MATERIAL FALLEN AWAY

BRUSH IMMEDIATELY DOWN STREAM OF DAM

NEW CONCRETE HEAD WALL POURED AT DOWNSTREAM END OF 48" DRAIN AT NORTH END OF DAM

DEC DAM INSPECTION REPORT CODING

1. River Basin - Nos. 1-23 on Compilation Sheets
2. County - Nos. 1-62 Alphabetically
3. Year Approved -
4. Inspection Date - Month, Day, Year
5. Apparent use -
   1. Fish & Wildlife Management
   2. Recreation
   3. Water Supply
   4. Power
   5. Farm
   6. No Apparent Use
6. Type -
   1. Earth with Aux. Service Spillway
   2. Earth with Single Conc. Spillway
   3. Earth with Single non-conc. Spillway
   4. Concrete
   5. Other
7. As-Built Inspection - Built substantially according to approved plans and specifications

Location of Spillway and Outlet Works

1. Appears to meet originally approved plans and specifications.
2. Not built according to plans and specifications and location appears to be detrimental to structure.
3. Not built according to plans and specifications but location does not appear to be detrimental to structure.

Elevations

1. Generally in accordance to approved plans and specifications as determined from visual inspection and use of hand level.
2. Not built according to plans and specifications and elevation changes appear to be detrimental to structure.
3. Not built according to plans and specifications but elevation changes do not appear to be detrimental to structure.

Size of Spillway and Outlet Works

1. Appears to meet originally approved plans and specifications as determined by field measurements using tape measure.
2. Not built according to plans and specifications and changes appear detrimental to structure.
3. Not built according to plans and specifications but changes do not appear detrimental to structure.

Geometry of Non-overflow Structures

1. Generally in accordance to originally approved plans and specifications as determined from visual inspection and use of hand level and tape measure.
2. Not built according to plans and specifications and changes appear detrimental to structure.
3. Not built according to plans and specifications but changes do not appear detrimental to structure.

General Conditions of Non-Overflow Section

1. Adequate - No apparent repairs needed or minor repairs which can be covered by periodic maintenance.
2. Inadequate - Items in need of major repair.

(Items) For boxes listed on condition under non-overflow section.
1. Satisfactory.
2. Can be covered by periodic maintenance.
3. Unsatisfactory - Above and beyond normal maintenance.

DEC

DEC DAM INSPECTION REPORT CODING (cont.)

General Condition of Spillway and Outlet Works

1. Adequate - No apparent repairs needed or minor repairs which can be covered by periodic maintenance.
2. Inadequate - Items in need of major repair.

(Items) For boxes listed conditions listed under spillway and outlet works.

1. Satisfactory.
2. Can be covered by periodic maintenance.
3. Unsatisfactory - Above and beyond normal maintenance.
4. Dam does not contain this feature.

Maintenance

1. Evidence of periodic maintenance being performed.
2. No evidence of periodic maintenance.
3. No longer a dam or dam no longer in use.

.S.)

Hazard Classification Downstream

1. (A) Damage to agriculture and county roads.
2. (B) Damage to private and/or public property.
3. (C) Loss of life and/or property.

Evaluation - Based on Judgment and Classification in Box Nos.

Evaluation for Unsafe Dam

1. Unsafe - Repairable.
2. Unsafe - Not Repairable.
3. Insufficient evidence to declare unsafe.

River Basins	Counties	
(1) LOWER HUDSON	1 Albany	36 Orange.
(2) UPPER HUDSON	2 Allegany	37 Orleans
(3) MOHAWK	3 Bronx	38 Oswego
(4) LAKE CHAMPLAIN	4 Broome	39 Otsego
(5) DELAWARE	5 Cattaraugus	40 Putnam
(6) SUSQUEHANNA	6 Cayuga	41 Queens
(7) CHEMUNG	7 Chautauqua	42 Rensselaer
(8) OSWEGO	8 Chemung	43 Richmond
(9) GENESEE	9 Chenango	44 Rockland
(10) ALLEGHENY	10 Clinton	45 St. Lawrence
(11) LAKE ERIE	11 Columbia	46 Saratoga
(12) WESTERN LAKE ONTARIO	12 Cortland	47 Schenectady
(13) CENTRAL LAKE ONTARIO	13 Delaware	48 Schoharie
(14) EASTERN LAKE ONTARIO	14 Dutchess	49 Schuyler
(15) SALMON RIVER	15 Erie	50 Seneca
(16) BLACK RIVER	16 Essex	51 Steuben
(17) WEST ST. LAWRENCE	17 Franklin	52 Suffolk
(18) EAST ST. LAWRENCE	18 Fulton	53 Sullivan
(19) RACQUETTE RIVER	19 Genesee	54 Tioga
(20) ST. REGIS RIVER	20 Greene	55 Tompkins
(21) HOUSATONIC	21 Hamilton	56 Ulster
(22) LONG ISLAND	22 Herkimer	57 Warren
(23) OSWEGATCHIE	23 Jefferson	58 Washington
(24) GLASSE	24 Kings	59 Wayne
	25 Lewis	60 Westchester
	26 Livingston	61 Wyoming
	27 Madison	62 Yates
	28 Monroe	
	29 Montgomery	
	30 Nassau	
	31 New York	
	32 Niagara	
	33 Oneida	
	34 Onondaga	
	35 Ontario	

DEC

New York State Department of Environmental Conservation

MEMORANDUM

TO: Robert S. Drew, Central Permit Agent

FROM: Robert Ryczek

SUBJECT: Dam Safety Inspection Report

DATE: August 23, 1972

D.O.T. Registered Dam No. 751
Lower Hudson River Basin
Township of Wawarsing
County of Ulster
Owner: Cape Pond Inc.
c/o Mr. Milford Misner, Secretary/Treasurer
R.D. 1, Box 154
Kerhonicson, New York 12446

On August 22, 1972, an inspection of the above dam was made by Principal Engineering Technician Robert Ryczek of this Department. The following is a report of the condition of the structure at the time of the inspection:

1. Description and Use of this Structure

The dam is situated on the Bear Kill 3 miles upstream of the Village of Ellenville and is known as the Cape Pond Dam. The impoundment behind the dam (in excess of 200 acres) is used for recreation by a private club with cottages located along its shores. At the time of the inspection, water was observed running out a 48" steel pipe located adjacent to the north end of the service spillway with the water elevation approximately one foot below the spillway crest. The dam, originally built in 1906 was reconstructed in 1914 to include a concrete ogee type spillway.

2. General Condition of Non-overflow Section

The exposed portions of the concrete core wall extending into the banks on either end of the structure have spald and cracked with portions fallen away. Trees and brush were observed growing along the downstream slope.

3. General Condition of the Spillway and Outlet Works

The face of the ogee spillway has spald in various areas with some leakage observed near its mid-point. Settlement under the spillway apron has taken place opening the construction joints and allowing vegetation to take root. Recent excavation of the stone rubble located above the 48" steel drain pipe at the north end of the dam and its new concrete encasement was noted. Stone rubble and brush were observed clogging the stilling basin.

DEC

4. Evaluation and Hazard Class

The dam has received little maintenance for a long period of time. A regular maintenance schedule is suggested with immediate attention given the stilling basin and spald sections of concrete. The dam has been given a "B" hazard due to its impoundment size. An access road to the opposite shore of the pond exists immediately upstream of the dam thus requiring the water elevation to be maintained below its designed height decreasing the impoundment considerably. Insufficient evidence was found to declare the dam unsafe.

DEC

OVERLOOK FARMS, INC.

LYONS RD.
MILTON, N. Y. 12547
PHONE: 914 - 795-5164

WILLIAM H. LYONS PRES.

JAMES S. LYONS SEC.

125-8-" - "

December 20, 1977

Re. - Dam Inspection
Cape Pond Inc.
Ellenville, N.Y.
#751 L.H.
B-C-?

Mr. William Righter
NYS DEC
50 Wolf Rd.
Albany. N. Y. 12233

Dear Sir:

This letter is in reference to an inspection of a private dam located in Ellenville, N.Y.

Per my telephone converation with Mr. Robert Green, New Paltz DEC, I hereby request an on site inspection of the concrete and earthern dam at Cape Pond Inc., Cape Road, Ellenville, N.Y. to evaluate maintenance program and condition.

Location is approximately three (3) miles west of Ellenville village adjacent to Cape Road.

This dam is a spillway type dam, concrete with thirty (30) ft. earthern backing, with two (2) working gates for control of water height.

Any information or help you could provide would be appreciated.

Please mail reply to my business address, as there are no winter residence at the Cape.

Very truly yours,

William H. Lyons

WILLIAM H. LYONS
President
Cape Pond Inc.
Ellenville, N.Y.

F3-20

3/ send to insp.

by 1/10/78 - call

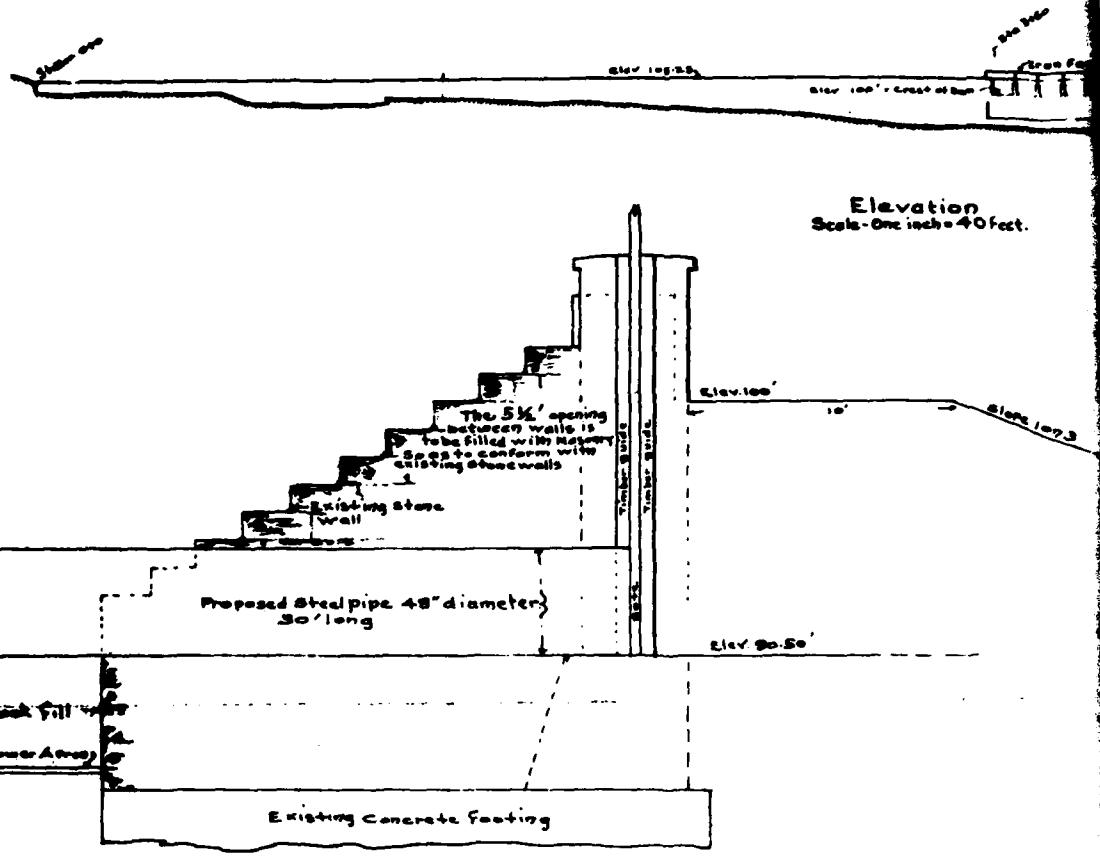
DEC 1/20/78 Re-insp- call Res. 1st week of good weather

APPENDIX G

DRAWINGS

TABLE OF CONTENTS

	Page
Proposed Concrete Spillway (modifications), by J. H. Divine - September 1914	G-1

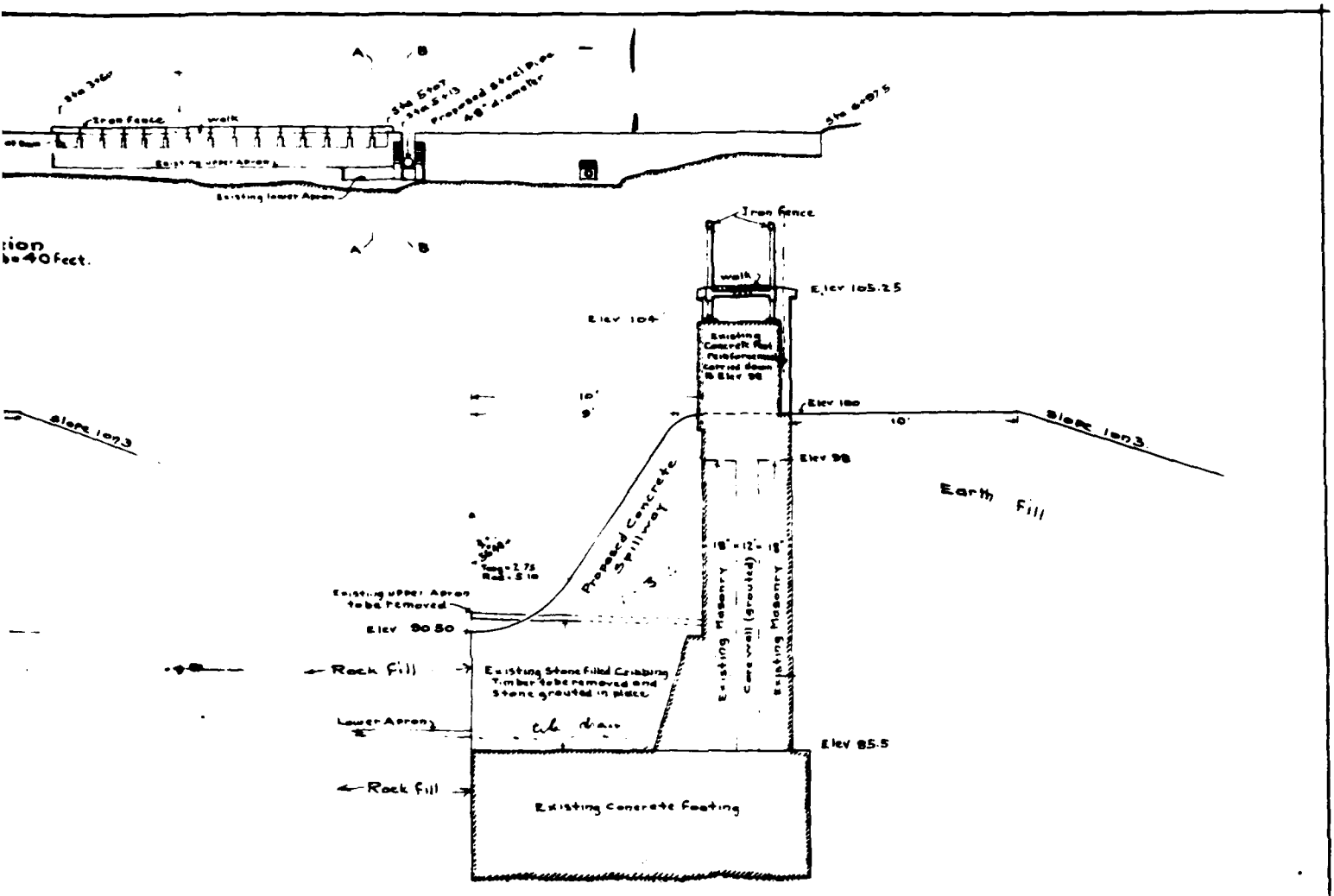


Section at B-B.
Scale ¼ inch = One foot.

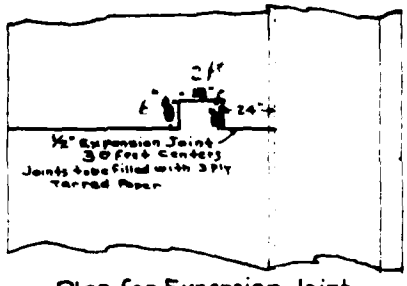
Dwight Divine and Son's.

Plan of proposed Concrete Spillway for
The Cape Pond Dam
in the Town of Wawarsing Ulster Co. N.Y.
J. H. Divine. Engineer
Ellenville N.Y.
September 1914.
Datum-as assumed Elevation
Base Bal.

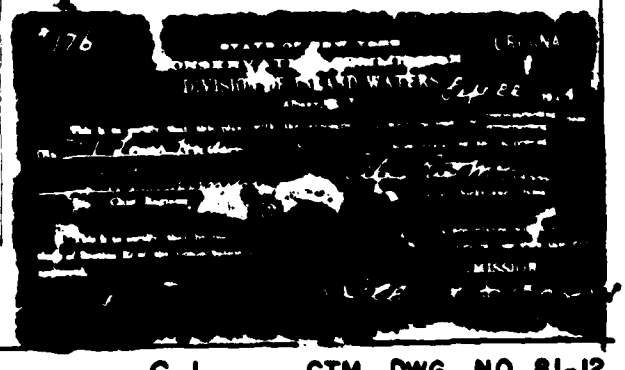
FROM DEC
REDUCED TO 60% OF ORIGINAL



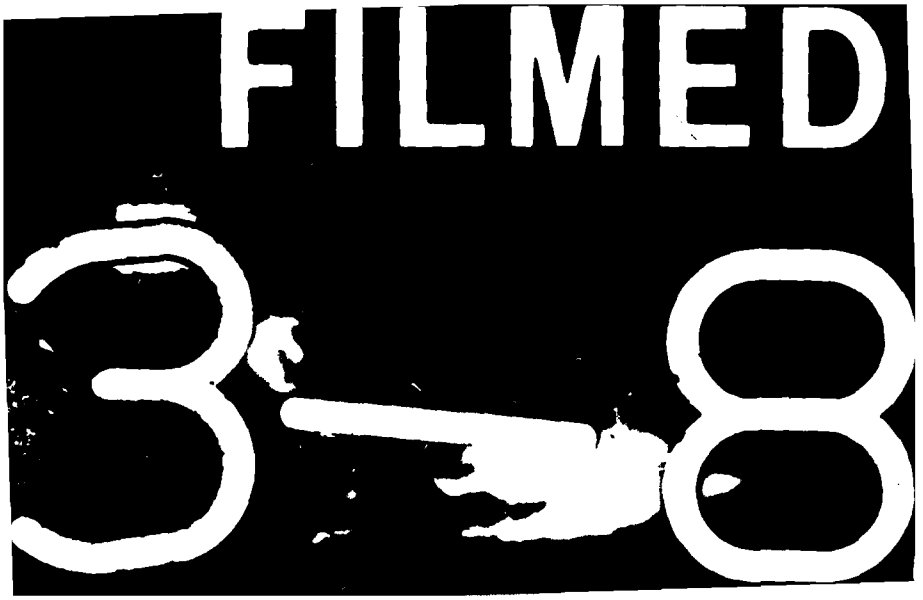
Section at A-A.
Scale ¼ inch = one foot



Plan for Expansion Joint
Scale ¼ inch = one foot



G-1 CTM DWG NO. 81-12


FILMED
3
8